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INSTITUTIONAL CAPACITY OF ELECTRICITY SUPPLY SERVICES FOR RURAL COMMUNITIES IN MUTALE LOCAL MUNICIPALITY OF LIMPOPO PROVINCE

By

MUDZANANI NKHANGWELENI SETH

STUDENT NO: 8500088

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Supervisor: Prof MP Khwashaba

Co-Supervisor: Mr. E Mahole

2015

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DECLARATION

I **Mudzanani N.S,** declare that this dissertation, hereby submitted to the University of Venda, for the degree of Master of Public Management, has not previously been submitted by me for a degree at this or any other university, that it is my work in design and execution, and that all material contained herein has been duly acknowledged.

Mudzanani ..... 07/05/2015 .....

Mudzani N.S **Date**

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- And lastly, the Lord Almighty, who strengthened and protected me during my years of hard work and journeys to the University of Venda;

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DEDICATION

On a personal note, I dedicate this project to my Parents. You were there for me all the way.

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ABSTRACT

This study examines the institutional capacity of electricity supply services for rural communities in Mutale Local Municipality of Limpopo province. Most African including those in the Southern sub-region faces a major challenge inn trying to achieve their development and social obligations because of serious lack of modern energy services. Electricity access clearly demonstrates this deficiency because it is only 17% for sub Saharan Africa as a whole and less than 5% in rural areas. This situation needs major changes for not only because of development demands but for the region and its sub regions to be competitive with other developing regions of the world. The financial analysis is based on primary and secondary data collected from selected districts in Maharashtra and Haryana. One of the principles of Batho pele is equal access to all the public services to which they are entitled, even the poor people must also have access to services such as free Basic Electricity services that might needed from Eskom.

The study used both quantitative and qualitative techniques for data collection and analysis. Quantitative techniques were mostly used in that they provided the researcher with an understanding of experiences and of institutional capacity of electricity supply services for rural communities in Mutale Local Municipality of Limpopo province. Purposive sampling was used for selection of sample for the study. Both primary and secondary data were used for analysis in this study. Secondary data were obtained from government publication, research publication, and report. Primary data were obtained through questionnaires and interview.

Major findings of the study are the following:

- The study has found that the level of education has an impact on the development of a particular area. Mostly an uneducated person tends to have less care on what is being done to develop the area. It was found that most of the electricity cables which been destroyed, is due to carelessness particularly by people with limited education and inability to value the grid electricity supply.

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- It was discovered that households have an income in the range of R100-R2000; this indicates a high degree of income inequity where few people have higher income while many receive low income. In most families, one person contributes towards the demands of the big family using a lower salary. Due to the lower salary, the family is encouraged to follow the proper in energy grid electricity supply practices.

- It is clearly indicated that to transform this community from candle usage is necessary. Candles are the most dominant energy source used for lighting, and these candles have some negative impacts on human lives. The increasing cost of paraffin has contribution in the manner in which the society chooses their energy source since they cannot afford to buy it on a daily basis.

Major recommendations were drawn from the study, these included:

- The Municipality must improve on the management and provision of electricity. The municipal officers must ensure that the electricity vending machines are at all times functional. The maintenance of the machines may be contracted to service providers whose service level agreement will determine their ability and continued contract.

- Since the community could not be completely separated from their traditional utilization of natural resources, renewal should be applied where applicable as an alternative to provide a chance for the biodiversity to regenerate and recover.

- The municipality, community members and headmen in the study site should consider participatory decision making on the management of woodlands and related activities. This would avoid conflict associated with harvesting of firewood and ownership.

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LIST OF ABBREVIATIONS

CML	Customer Minutes Lost
ESCOM	Electricity Supply Commission
EVKOM	Elektrisiteits voorsienings kommissie
FIT)	Feed-In-Tariff
LOLE	Loss Of Load Expectation
NER	National Electricity Regulator
Nersa	National Energy Regulator of South Africa

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CHAPTER 1: ORIENTATION OF THE STUDY

1.1 Introduction

When the democratic government was elected into power in 1994, the dawn of democratic government in South Africa ushered the development and restructuring of the country holistically. There was a need for a new national system to correct the past injustices by means of providing better life for all as enshrined in the Freedom Charter (Davidson & Sokona, 2002:55), the provision of basic needs to all citizens who stay in South Africa. In spite of several policy initiatives taken by the Government of South Africa and progress in extending the national grid, 56 percent of rural households still do not have access to electricity. In many areas, despite grid availability, households have chosen not to connect, frequently because of the insufficient and unreliable supply of electricity.

Another area of regional concern is the strong links between modern energy service provision and poverty reduction in the region. For the region to achieve the Millennium Development Goals (MDG) it agreed to at the WCSD held in Johannesburg in 2002, it needs substantial increase in modern energy service provision, especially affordable, reliable and adequate electricity. Improving on the current high infant mortality, low life expectancy, and high illiteracy and fertility rates of the region (World Bank, 2003) will require substantial electricity provision, particularly for the poor that are very much deprived of these services.

Unfortunately, recent report suggests that the share of the poor in the region is growing and may continue to do so if no major policy intervention is introduced (ref). Increase poverty has been mainly a result of neglect in rural areas and growing urban poor as a result of high migration rates. Developing policies, especially in the energy and power sector to cope with these challenges is very important for the overall net productivity of the region as whole.

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1.2 Background of the study

Most African including those in the Southern sub-region faces a major challenge in trying to achieve their development and social obligations because of serious lack of modern energy services. Electricity access clearly demonstrates this deficiency because it is only 17% for sub Saharan Africa as a whole and less than 5% in rural areas (Davidson & Sokona, 2002:23). This situation needs major changes for not only because of development demands but for the region and its sub regions to be competitive with other developing regions of the world.

Service delivery is one of the key elements in determining the future success in an organization. A phenomenon that not planned, lead and executed effectively can lead to the downfall to a business. According to Du Toit, Knipe,Van Niekerk, Doyle and Van der Walt (2002:88) service delivery originated thousands of years before the birth of Christ therefore from this statement alone we can conclude that even before our existence the way in each they treaded had to be in some kind of service delivery. Individuals, groups, communities and societies require particular services, which may be basic to their existence. The diverse nature of services required is influenced by various factors. People want the delivery of services of all kinds in their different categories according to Maila in the Capricorn Voice (2006:10).

Government has a responsibility to ensure the electrification of all its citizens, particularly, the poor in rural areas, to uplift the people and make life a little easier. It is widely recognized that access to and supply to modern energy plays an important role in poverty alleviation and sustainable development. Access to electricity can bring many positive impacts including poverty alleviation and improved child education.

The utility is the largest producer of electricity in Africa, is among the top seven utilities in the world in terms of generation capacity and among the top nine in terms of sale generated from capacity. As the national electricity supply authority in South Africa, Eskom is responsible for the generation and supply of electricity to consumers throughout the country.

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As electricity cannot be stored, power is generated and delivered over long distances at the very instance that it is needed. Eskom operates a number of notable power stations, including Kendal Power Station, and Koeberg nuclear power station in the Cape Province, the only nuclear power plant in Africa. The company has different divisions namely Generation, Transmission and Distribution. Eskom generates approximately 95% of electricity used in South Africa.

Eskom is committed to providing energy needs throughout to countries like Zimbabwe, Zambia, Mozambique, and Swaziland. The year 2006 saw beginning of electricity power cuts in South Africa which took the country by surprise and saw many households and businesses suffer as they could not meet their basic energy demand. South Africa began suffering from an electricity crisis. Blackouts have been widespread and the impact disastrous. Electricity supply is predicted to constrain growth for at least the next five years.

Eskom has a service charter which is set out to be the core guideline to dealing with Customers namely:

- Accurate measurement of consumption
- Error-free bills
- Be treated with respect
- Experience excellent treatment on Eskom's electricity supply contract
- Be dealt with promptly and efficiently
- Be treated fairly
- Have their property treated with respect
- Confidentiality of their information
- One stop service without referral
- Quality of Supply in terms of negotiated agreement
- Be involved in issues affecting them.

Eskom has set itself an objective of becoming a world-class customer service organisation. This translates in GCS being mandated to "put the customer at the centre of our business and guide Eskom towards the overall objective of achieving

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full satisfied and serviced customers will consistently rate Eskom in the top quartile and therefore will promote a positive image.

1.3 Statement of the problem

The Constitution of the Republic of South Africa (1996), section 153, requires of Government at all levels to provide services to its citizens. Such services are, among others, in the form of infrastructure development, electricity, social security, education, health services, safety and security and social development. This requirement is expected to be realised in all spheres of Government by all institutions of Government. It therefore becomes a serious challenge for Eskom to ensure the provision of services to all its customers.

Eskom customer's faces challenge in accessing Eskom offices for services especially at the rural communities. The distance between customers and city centres are vast, millions of rural houses do not have street addresses (often there are no visible roads), and transport infrastructure is poor. In some tribal areas it is custom to be a good distance from your neighbour which increases the cost of providing infrastructure. Postal deliveries in these rural areas are not common. Thus, the emphasis of this study is the challenges faced by customers in getting assistances from Eskom under Thohoyandou Customer Service Area.

The looming issue of shortages due to inadequate supply and the issues of quality supply to all rural and urban areas go unaddressed. Universal household access to electricity is one of the cornerstones of the White Paper on Energy Policy. The connections made during the electrification programme (1994 to date), were mainly in the urban areas. This disparity in the provision of electricity to households can be attributed to the increasingly high cost of extending the grid to rural areas that are remote from the existing network; low density of houses; low electricity consumption; and bad terrains. Providing electricity to the poor in southern Africa which this paper is restricted poses unique policy challenges because although the sub-region has abundant fossil and renewable energy resources, exploiting these resources remains a daunting task because of major technological, institutional and financial obstacles, but financial obstacles remain the most important. Inadequate

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energy investments, an underdeveloped downstream energy sector and poor management are some of these barriers, and the poor are the most affected.

1.4 Aim of the Study

The overall aim of the study is to institutional capacity of electricity supply services for rural communities in Mutale Local Municipality of Limpopo province

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1.5 Specific Objectives

- To determine the effects of accessibility of electricity services for rural communities in the Mutale municipality
- To identify factors affecting the basic electricity distribution in the Mutale municipality.
- To examine the impacts socio-economic based on the shortage of the energy in the study area.
- To identify the challenges experienced by the ESKOM customers regard to electricity in Mutale Local municipality.
- To assess the problem of backlogs of electricity supply in Mutale Local municipality.

1.6 Research Questions

- What are the effects of accessibility of electricity services for rural communities in the Mutale municipality?
- What are factors affecting electricity distribution in the Mutale Local municipality?
- What are socio-economic impacts based on the shortage of the energy in the study area?
- What are the challenges experienced by the ESKOM customers regard to electricity in Mutale municipality?
- What is the impact of backlogs of electricity supply in Mutale municipality?

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1.7 Significance of the Research

The importance of this study is to help the Eskom rural customers to have an easy access to Eskom services and offices (Bathopele). ESKOM, community and Municipality will be the benefit from the study by understanding the accessibility of electricity. The study will add to theoretical framework on challenges that municipality in Republic of South Africa generally is experiencing. It will provide strategies to speed up the supply of electricity to its communities. The study will enhance the skills and knowledge to the managers on dealing with electricity shortage. Through this study, Local Economic Development will be stimulated if the strategies suggested in this study are implemented, meaning that there will be job creation, poverty alleviation as well as the improvement of the infrastructures for the entire communities. Electricity supply will also stimulate Small Businesses into the communities. The standard of living will also be raised. The rate of deforestation will also be limited because communities will connect to electricity. There will be an opportunity for communities to learn new basic skills.

1.8 Delimitation of Research

This study will be restricted to the rural villages in Mutale Municipality which falls under Thohoyandou Customer Services Area. These villages are 100 to 200 kilometres away from Eskom customers Services office which is based in Makhado town and it is the nearest Eskom office for all the above mentioned villages.

1.9 Limitation of the study

Funds were limiting factor as the study required a lot of funds for travelling, typing, binding and photocopying. Due to the sensitivity of the topic, some people will feel uncomfortable to answer research questions because they are not sure where the information will be taken to.The researcher would like to visit all the rural areas in the Vhembe District which are falling under Eskom Thohoyandou Customer Services Area but however due to distance of more than 400 kilometres in between some villages, there will be a challenge to get access all the mentioned villages.

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1.10 Definitions of Selected Concepts

- **Illegal Connection**

Illegal connecting is Connecting electricity with non-standard wiring equipment's that are not approved by Eskom. It also refers to meter tampering and meter bypass (Conradie 2004:73).

- **Customer Service**

It is the provision of services to customer before, during and after a purchase. According to Turbanatal. (2002:99) Customer Service is a series of activities designed to enhance the level of customer satisfaction that is feeling that a product or services has met the customers' expectations. Customer service provides help to answer questions customers have about a product or service, and assist them in whatever help they may need.

- **Eskom**

According to Conradie (2004:73) Eskom is derived from the Afrikaans abbreviation Eskom (Electrisiteits Voorsienings Kommissie), which stands for Electricity Supply Commission established in 1922. This study refers Eskom as the service agent delivering electricity services in the municipality.

- **Electricity**

Eskom pricing, Conradie (2004:10) refers electricity as a form of energy occurring in negative charge particles. The flow of electricity that it consist of little particles like little balls pushed through a pipe (circuit) allow the transfer of energy causing electricity current to flow. The amount of electricity used by a particular piece of electrical equipment is measured in watts.

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- **Service Delivery**

Section 1 (2:12) of the White Paper on Public Service Delivery (1997) refers service delivery as an approach which puts pressure on systems, procedures, attitudes, and behavior within the Public Service and reorients in the customer's favour, an approach which put people first. White Paper goes further indicating that service delivery involves creating a framework for the delivery of public services which treat citizens more like customers and enables the citizens to hold public servant to account for the services they serve.

1.11 Organisation of the research

CHAPTER 1: ORIENTATION OF THE STUDY

This chapter outlines the introduction, statement of the problem, objectives of the study, limitation and delimitation of the study, clarification of the concepts proposed structure of the study.

CHAPTER 2: LITERATURE REVIEW

The chapter presents a conceptual overview of literature relevant to the theory. The literature on the Constitutional, policy and legislative frameworks were reviewed and an overview of historical background of the municipalities given.

CHAPTER 3: RESEARCH DESIGN AND METHODOLOGY

The chapter will outline the research design and method used in the study. Different sources of research to access and collect the analysis of accessibility of ESKOM electricity services for rural communities in the Mutale Local Municipality.

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CHAPTER 4: DATA INTERPRETATION, PRESENTATION AND ANALYSIS

The information collected will be presented and analyzed in this chapter. The results obtained from the respondents studied and interpreted in accordance with the title of this study.

CHAPTER 5: FINDINGS, CONCLUSION AND RECOMMENDATIONS

This chapter provides a summary of findings analysis of accessibility of ESKOM electricity services for rural communities in the Mutale Local Municipality, conclusions and appropriate recommendations based upon the findings are made.

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2.1 Introduction

The literature review on challenges faced by Eskom customers to access Eskom offices for services provides the point of departure for this study. The literature study is utilised to establish a theoretical framework for this study and refer to the study and analysis of all the relevant available literature in the form of books, periodical articles and newspapers. Sources such as reports, letters and Eskom documents will be used in an effort to gain an understanding of actual factors that led to customers to struggle to get access to the Eskom offices.

This chapter covers possible options of improving the supply of electricity to rural areas and discusses their pros and cons. It concludes that the DG&S model succeeds in markets where the economics of current electricity supply and coping costs of consumers justify the additional costs of localized distributed generation. The chapter then develops the economic framework for identifying markets that are attractive to DG&S and the financial mechanisms that ensure the model will become commercially viable for investors and utilities (Borchers et al., 2001:67).

The financial analysis is based on primary and secondary data collected from selected districts in Maharashtra and Haryana. One of the principles of Batho pele is equal access to all the public services to which they are entitled, even the poor people must also have access to services such as free Basic Electricity services that might needed from Eskom. Eskom's customer service charter says customers have the right to the following: Accurate measurement of consumption, error-free bills, be treated with respect, experience excellent treatment on Eskom's electricity supply contract, be dealt with promptly and efficiently, be treated fairly, have their property treated with respect, confidentiality of their information, one Contact Resolution, quality of supply in terms of negotiated agreement as well as be involved in issues affecting them. Eskom's customer service strategies is to ensure that Eskom provides excellent service in the following "bedrock" areas such as quality of Supply, outage Management, accurate accounts and speedy Payment

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Allocation, communication, connection time, and provide cost effective and efficient Customer Service through infrastructure processes, systems and staffing. Eskom has the following service standards a Contact Centre and Customer Service offices are open during office hours 08h00 to 16h00 Monday to Friday. Payment points and prepaid vending stations operated by external agencies operate according to their own hours of business (Borchers et al., 2001:67).

But still the customers are still struggling to get access to Eskom services due to distances between them and the Eskom offices. Eskom also has a vision of setting itself an aspiration of becoming a world-class Customer Service Organisation. This translates in GCS being mandated to "put the customer at the centre of our business and guide Eskom towards the overall objective of achieving full satisfied and serviced customers who consistently rate us in the top quartile and promote Eskom as a company (Borchers et al., 2001:67).

2.2 Legislative framework

It is also found important to look at the policy framework that governs the local sphere of government. By considering such policy framework it will be easier for the reader to have a clear picture of how the activities of ward committees must be aligned to these pieces of legislation.

2.2.1 The Constitution of the Republic of South Africa Act of 1996

The basis for all laws in the country is the national Constitution of the country, which is the supreme law upon which all other laws are based. In terms of local government affairs, the Constitution recognizes them as a distinctive level of government and mandates them to give priority to the basic needs of the community, and to promote the social and economic development of the community, and participate in national and provincial development programmes, 1996a. The constitution makes provision for different categories of local government, which the Local Government White paper,1998a defines as:

- Metropolitan Councils, i.e. large conurbations with multiple business districts;

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- Municipal Councils, i.e. non- metropolitan local councils; and
- District Councils which oversee groups of Municipal Councils in urban and rural areas.

2.2.2 Local Government Transition Act , 1993 (Act 209 of 1993)

Although the more recent legal provisions pertaining to the development role of local government have been based on the1998 Local Government White Paper, 1998a pre-1998 Acts have also served as a basis for this new role. The Local Government Transition Act, 1996c assigned various powers and duties relating to service provision to local governments and specifically required metropolitan councils to promote integrated economic development, the equitable distribution of municipal resources and the delivery of services with a developmental focus in mind.

2.2.3 The Development Facilitation Act, 1995 (Act 67 of 1995)

A key local government planning and development instrument is the Development Facilitation Act, 1995 which introduced measures to facilitate and accelerate the implementation of reconstruction and development programmes and projects in relation to land, laying down general principles to govern land development throughout the country. Local governments are empowered to develop what are known as 'Land Development Objectives'. This Act was formulated to rationalize the complex apartheid geography of the country, to redress development imbalances and accelerate development through more efficient utilization of land.

2.2.4 The Municipal Demarcation Act, 1998 (Act 27 of 1998)

The Local Government Municipal Demarcation Act, 1998c determined new municipal boundaries throughout South Africa. This process was undertaken between 1998 and 2000. This Act sought to eliminate small and ineffective local councils by combining neighbouring or close local authority areas under a single jurisdiction, while also assigning rural areas surrounding urban centres to the control of the latter.

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2.2.5 The Municipal Structures, 2000 (Act 33 of 2000)

The Municipal Structures Act, 2000 with the Systems Act, extends and develops the provisions of the Local Government Transition Act of 1996, 1996c. The Act also allows for participation of traditional leaders within local government administration in the areas in which they reside. It also mandates district councils to assist municipalities lying within the areas under their jurisdiction through integrated development planning, major infrastructural development, capacity development and the equitable distribution of resources.

2.3 Institutional capacity of electricity supply services for rural communities

Eskom is a South African electricity public utility, established in 1923 as the Electricity Supply Commission (ESCOM) by the government of South Africa in terms of the Electricity Act (1922). It was also known by its Afrikaans name Elektrisiteits voorsienings kommissie (EVKOM). The two acronyms were combined in 1986 and the company is now known as Eskom. Eskom represents South Africa in the Southern African Power Pool.

The utility is the largest producer of electricity in Africa, is among the top seven utilities in the world in terms of generation capacity and among the top nine in terms of sales. Eskom operates a number of notable power stations, including Kendal Power Station, and Koeberg nuclear power station in the Cape Province, the only nuclear power plant in Africa. The company is divided into Generation, Transmission and Distribution divisions and together Eskom generates approximately 95% of electricity used in South Africa (Cowan, 2003:44).

Due to the South African government's attempted privatisation of Eskom in the late 1990s, Eskom's requests for budget to build new stations were denied. President Thabo Mbeki said in December 2007 that this was an error, and it is now adversely affecting the South African economy. There were problems with regard to access and use of electricity for production purposes as observed by the researcher and reported by interviewees (Cowan, 2003:23),. These were:

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- In Mutale Community the grid electricity did not pass through the village, therefore the service was still not available in some areas due to lack of service line materials such as fuses, cables, poles and transformers.
- Illegal connection and vandalism of cables and cooling transformer oil in the distribution network. This caused blackouts, which discourages new customers to apply for connection.
- There was low voltage supplied and fluctuations outside the acceptable range found in the study areas. The electricity services supplied was not available and reliable, and most of the time especially in the evening hours the electricity supplied was under - voltage and there are frequent blackouts.
- Low income for most of community members to meet application standards was another constraint observed in the study areas. In order to qualify for connection the customer must meet certain minimum standards stipulated by TANESCO which are permanent house roofed with iron sheet and completed wiring approved by electrical engineer or technician. This system automatically excludes most of very low-income families.

Though there were many limiting factors for not applying for grid electricity connection, many applications were still pending due to lack of connection materials such as cable and fuses. This problem was more severe because electric supply company had limited funds to run its activities. However, there was private electric supply company/organization dealt with providing other viable alternative source like solar PV and biogas but these alternatives provided at a very high cost, which is not affordable to most rural people. In general, the availability of grid electricity services in rural areas stimulates establishment, growth and expansion of micro-enterprises at a low rate; also contribute to decline and closure of micro-enterprises due to market saturation and high competition. The livelihood characteristics of entrepreneurs and employees had changed as a result of taking up electricity services for production or operating the enterprises for example accumulation of physical assets such as modern houses, radio cassette, cattle, and saloon cars (Davis, & Ward, 1995:34).

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There were some barriers found to be experienced by the micro-enterprises in accessing and using electricity services for production. Electricity services were not available in some areas due to a lack of connection materials like fuses, cables, poles and transformers; In areas where electricity services were available the problem was complicated by the tariff structure such as high initial connection and installation fees and high monthly bills; illegal connection and vandalism of cables and cooling transformer oil, low voltage supplied and fluctuation.

These problems caused blackouts which discouraged new customers to apply for connection. In addition, the low income for most of community members to meet application standards for installation and connection of electricity services in their business was another barrier limiting access to grid electricity services (Davis, & Ward, 1995:34). In the context of power quality, voltage quality includes harmonic distortion, voltage dips (also called sags) and swells, unbalance between phases, and voltage fluctuations in the steady state, which appears to be the most critical aspect for rural supplies. Prescribing a narrow band for allowable voltage variation leads to higher investment cost. Conversely, increasing the range of permissible voltage variations might increase the cost of appliances, reduce appliance efficiency and lifetime, and increase a utility's distribution losses.

Most countries adopt limits for voltage variation in the range of +10% to -10% of the nominal voltage, with further limits on how much or for how long the voltage is allowed to be outside the specified range. Research into the optimisation of the combined voltage variation in the medium and low voltage systems taken together indicate that that relaxing the lower limit of voltage for rural electrification could significantly reduce a utility's lifetime costs. At the same time, customer surveys and network measurements indicate that lower voltages than the regulated minimum do not significantly affect rural residential customers and do not generate customer complaints. However, less voltage variation might be needed for supplies to non-domestic customers in rural areas to avoid problems with large motors characteristic of industry (Davis, & Ward, 1995:34).

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2.4 Reliability of grid electricity supply in Mutale Local Municipality

Anecdotal evidence suggests that rural customers are more concerned about the continuity of supply (interruptions and dips) than other aspects of voltage quality. Reliability of supply at the load point depends on the reliability of generating plant and the supply network. It is common to distinguish between security and availability of supply as measures of the standard of electricity supply services (DME, 2003:19).

2.4.1 Security of supply

Supply security is the ability of a system to maintain supply to a defined level of demand under defined outage conditions. Network planning to satisfy security standards tends to rely on deterministic criteria such as n-1. In practice security performance is assessed through frequency and duration of outages using metrics such as number of customer interruptions (CI) and customer minutes lost (CML) (DME, 2003:12).

2.4.2 Availability of supply

In the planning phase a popular metric for availability of supply is the loss of load expectation (LOLE) which is used to compute the long term average of unsupplied energy associated with failures in generating plant. For grid connected rural load the grid supply point can be used as proxy for generation and hence similar to generating plant reliability, grid supply point reliability can be used to compute unsupplied energy. In the operational phase estimates of actual unsupplied energy are computed from the magnitude of power lost during an outage and the duration of the outage. However, the value of energy not supplied is not the full cost of an interruption, which also includes costs incurred by the customers (DME, 2003:12).

A variety of reliability indices for distribution systems have been defined by IEEE Working Group on System Design (DME, 2003:12). These indices can be divided into three categories: single load point indices, customer orientated indices, and load orientated indices.

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2.5 National Electrification Programme in South Africa

The South Africa National Electrification Programme (1994-99) was a government financed initiative. The programme was implemented by Eskom and the municipalities with the key objective of raising national electrification levels to about 66 per cent by 2001 with 46% rural and 80% urban (NER, 2002a). The targets of the programme were mainly the formerly disadvantaged and rural areas, and all schools and clinics. This implied providing electricity to an additional 2.5 million households. This programme provided the basis of looking at the electrification levels and rates to the poor of South Africa.

The new connections were mostly extended by Eskom and the municipalities, but large scale farmers also connected their farm workers where necessary, but Eskom accounted for about two-thirds, while the municipalities only account for about 6% (Eskom, Republic of South Africa, 2004). However, there has been a slight drop in new connections which averaged around 450,000 households per year between 1994 and 2000 to 397,000 in 2001. The decline is due mainly to the drop in new connections by Eskom (CALS; 2003:99).

2.6 Brief overview of options to enhance rural power supply

The existing options to increase electricity access focus either on enhancing centralized generation or improving efficiency in the distribution business. This is done through stand-alone distributed generation projects feeding into the grid or establishing an input-based distribution franchisee. But neither of these addresses the basic issue of the unavailability of electricity in rural households. The current mechanisms are based on two fundamental choices:

- Centralized generation (status-quo) or localized distributed generation.
- Utility managed distribution (status-quo) or private distribution franchises.

The feed-in-tariff (FIT) distributed generation model (localized generation that feeds into the grid combined with utility managed distribution), already prevalent in Mutale municipality, could address the rural supply situation provided that locally generated

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distributed power is earmarked for serving rural areas. But this never happens in practice as the power from distributed sources is diverted to urban markets along with other common pools of resources. Also, the FIT often is more expensive than the current utility power procurement costs, hence, it has substantial impact on its overall power purchase costs and tariffs (Davidson, and Mwakasonda,. 2004:77).

In areas where the power situation adequately serves rural areas, rural distribution franchises, which combine centralized generation with private distribution franchisees, could very well improve service and reduce technical and commercial losses. India has already experimented with this model successfully, particularly in the city and in the rural areas of Blouberg Municipality. But these individual models do not address all issues facing rural markets, such as high distribution and commercial losses, very low supply hours, deteriorating quality, and unreliable service.

A combination of existing models would not only facilitate a strong role for the private sector; it would also increase the supply of electricity to underserved areas. In this case, power from a distributed generation plant is ring-fenced to supply the local rural area first. The improved underlying commercial aspects of the market reduce the subsidy for supporting distributed generation. This would allow private developers to generate and distribute electricity locally by acting as the utility's franchisees. Such a model would augment generation using local resources and supply power to areas that otherwise may remain power-starved despite having access to the grid. There are three options to enhance electricity supply in rural areas:

- FIT model: Distributed generation plants sell power to the grid at FIT determined by the regulator, and this power is added to the utility's centralized pool.
- Rural distribution franchisee (RDF): An input-based distribution franchisee is appointed by the utility for metering, billing, and collection activities, but is not permitted to source power beyond its contract with the utility.

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- Distributed generation and supply (DG&S): Combined generation and distribution, i.e., in addition to distributing power and collecting revenues, the franchisee also generates power locally and supplies to the franchised area.

In the DG&S model, the franchisee also generates power locally and supplies most of the plant's output (more than 70 percent) to rural franchise areas. The surplus power, if any, is fed back into the grid and is paid for by the utility at the appropriate FIT (in case of renewable energy as per power purchase agreement [PPA]). Operational subsidies or additional income is provided to incentivize DG&S operator to first meet local demand before routing power to the grid (Davidson, and Mwakasonda,. 2004:77).

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The utility significantly reduces its aggregate technical and commercial (AT&C) losses for serving the area. In addition, if the local plant is renewable-based, the capacity is credited against its renewable portfolio obligation (RPO) quota as determined by the State Electricity Regulatory Commission (SERC). This model has the advantages of distribution franchises (reduced AT&C losses and improved customer service) and the following additional benefits to the stakeholders:

2.6.1 Customers

- Increasing reliability and service levels.
- Increasing electricity availability (as local generation is captive, the rural areas are guaranteed supply).
- Accelerating community development. (While not sufficient by itself, the availability of guaranteed, long-term, reliable electricity from a local source can spur economic growth through energy intensive value-added service industries.)

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2.6.2 Utility

- Contributing to the RPO of the utility if the local plant uses a renewable energy resource.
- Avoiding transmission charges and losses associated with centralized power sources by using local generation utilities.
- Meeting its service obligations.

2.6.3 Regulators

- Meeting the goals of improving availability, reliability, and quality to rural areas.
- Increasing generation capacity by encouraging private distribution franchises to invest in distributed generation.

As part of this study, TERI undertook a field survey across selected rural districts in 2009. Domestic, commercial, and agricultural consumers reported that an improved power supply could have a significant impact on their socioeconomic status. The possibility of establishing new commercial establishments was also emphasized. These could include shops that sell electronic goods and home appliances; flour mills and bakeries; motor service shops; general stores and clothing stores; spice-floor mills; pharmacies; cyber cafés; welding and repair shops, furniture shops; and agricultural industries, including poultry farms and dairies. While such development is a key feature of off-grid plants, this will be significant in the DG&S model also. The pilot program can be implemented in areas where programs to support rural development already exist or can be designed to stimulate economic activities and boost demand (Eskom; 2005:88).

2.7 Electricity Service delivery quality – an unresolved challenge

Affordability is undoubtedly the key problem for poor households to truly benefit from electricity access in a way that improved the social living conditions and the welfare of individuals and communities. Directly related to the affordability problem are

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numerous other issues, which in sum, make the promise of quality service delivery for all an empty one for many poor people. Being unable to afford basic electricity needs often leads to a cycle of arrears, billing disputes, electricity cut-offs and illegal re-connections with negative impacts on poverty reduction on the one hand and causing consumer dissatisfaction to the brink of (local) political instability on the other hand (Eskom; 2005:88).

2.7.1 Arrears

The inability to pay for their basic electricity needs has resulted in high arrears for many poor people. In their survey conducted in Soweto Fiil-Flynn and SECC (2001:99) established that average monthly bills in the sample households were between R 150 (summer) and R 500 (winter). Given the average income levels in Soweto and the need to provide for other basic needs such as food, water etc. these bills can effectively not be paid by many households. As a consequence, 89 % of the sample household in the above-mentioned study (Fiil-Flynn and SECC 2001: 10) had electricity arrears, 30% of them owing more than R 10.000, an amount that is effectively unpayable given the household incomes in the area (ISES; 2001:12).

Interestingly, some of these arrears date back to the 1980s and the "rent boycotts" of the anti-apartheid struggle (Seekings 2000). Although it was agreed in negotiations with civics that Eskom would write-off half of all debt accumulated to June 1995, many residents claim that Eskom did not honour the write offs (Fiil-Flynn and SECC 2001: 10). Yet, even where the write-off is honoured, amounts are often so high, that re-payment of the remaining 50 % (and new arrears) is unrealistic (ISES; 2001:12).

It needs to be pointed out that, despite identical results (non-payment), the reasons for non-payment today compared to the reasons during the apartheid area, differ fundamentally. During the apartheid area inability to afford electricity might have played a role, however, it was not the main driver of the rate boycotts and the often cited "culture of non-payment" (Swilling 1998:49). In the times of the political struggle against the apartheid regime, non-payment of rates and service fees was a deliberate political tool, a means of protest against the policies of the apartheid government.

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Today's non-payments, as Fiil-Flynn and SECC 2001: 11) claim, cannot anymore be linked to the "culture of non-payment" and is simply a result of the real inability to pay. In fact, the majority of people try to make regular payment of bills and arrears wherever their financial situation allows, but are unable to pay the full amounts of their bills or reduce the arrears with the low or unstable incomes that most people of poor households receive (Fiil-Flynn and SECC 2001: 11).

2.7.2 Service cut-offs and illegal connections

For many people the continuing inability to pay and mounting arrears eventually lead to electricity cut-offs by Eskom (or the local municipality where it is the provider). In the above-mentioned survey (Fiil-Flynn and SECC 2001) it was established that more than 60 % of households had experienced electricity cut-offs in the past year. Where residents are able to renegotiate payment with Eskom, electricity supply has eventually been reinstalled, however, often electricity cut-offs lasted for months. For those who are not financially able to make payment arrangements with Eskom the cut-offs often lead into a cycle of worsening poverty. In order to meet their basic electricity needs people make illegal grid-connections. Interestingly, in about half of these cases, the illegal connection is offered by the same Eskom employee who had originally disconnected the resident, usually at a charge up to several hundred Rand (Fiil-Flynn and SECC 2001: 15). When these illegal disconnections are discovered by Eskom it leads to the permanent removal of electricity cables from the house by Eskom.

Once the cables have been removed, the price of reconnections is often impossible to meet for poor households meaning that they have to live permanently without electricity with adverse impacts on their living and welfare conditions. Negative effects named by poor people that had experienced cut-offs are that they are not able to cook food properly, that their personal hygiene is affected, that children cannot study properly and that the work load for women increases (Fiil-Flynn and SECC 2001). In addition the necessary increased use of alternative energy sources such as wood, coal and paraffin causes increases in health problems, particularly respiratory illnesses. Safety is also negatively affected by the cut-offs, as Eskom

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employee purposefully leave electricity sub-station open in order to make a second income from illegal electricity connections (Fiil-Flynn and SECC 2001: 14).

Another response by Eskom and municipalities to the high rate of non-payment has been the installation of pre-paid meters in households. When using this system, consumers pay a certain amount of electricity pre-paid and load it on their meters for subsequent consumption. Whereas this allows for efficient monitoring of consumption and can contribute to energy savings, it also means that people are left without electricity once the pre-paid electricity units are used up. Since poor residents are often unable to buy enough pre-paid units for the month, they frequently end up having no electricity towards the end of the month. This has cause strong opposition against the installation and use of pre-paid meters and some protests have resulted in the deliberate destruction of the meters.

2.7.3 Billing disputes

The issue of electricity cut-offs is closely related to problems that residents experience with billing and customer care by Eskom. Many respondents who had experienced cut-offs claim that insufficient notice is given (i.e, they are not given a chance to pay or to try and negotiate a payment schedule) and that cut-offs happen even when bills have been negotiated or settled (Fiil-Flynn and SECC 2001: 12). Notices of cut-offs are printed on the electricity bill, often giving the resident just 14 days to reply. Apart from the very short notice before cut-offs, it is often the case that bills are not received regularly, making it difficult for consumers to be informed of their payment situation and their arrears.

In response to this problem, Eskom claims that customers are responsible for collecting their bills at local Eskom depots if they are not delivered and are therefore responsible for knowing if their service is to be cut (Fiil-Flynn and SECC, 2001: 12). Whereas this is a rather unusual practice compared to service and consumer care experienced in more affluent areas, it also needs to be questioned in relation to the short reply period of 14 days that is granted. If a consumer first has to wait and find out whether or not his bill is delivered and after coming to the realization that it will

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not be delivered has to go to the local depot to fetch it, if leaves little time, if any, to reply to cut-off notices and make possible payment arrangements with Eskom.

Another problem relating to billing disputes and insufficient consumer care is, that according to respondents in the study conducted by Fiil-Flynn and SECC (2001) the bills do not inform the consumer how to dispute the bill. Nor do the bills inform consumers of the existence of the National Electricity Regulator (NER) as a place to take their account disputes.

Furthermore, cut-offs are often performed when consumers have already made arrangements for repayment and in some cases no notice is given prior to a cut-off (Fiil-Flynn and SECC 2001: 12). Poor consumers generally feel that Eskom staff has a negative attitude towards them and is unwilling to assist in billing disputes or even explaining the bills. It is this combination of inability to pay for basic needs and receiving poor consumer services that has sparked the ongoing protest against electricity cut-offs in the townships and the more recent wave of (sometimes violent) protest against poor service delivery in many areas in South Africa.

2.8 Challenges of electricity supply in South Africa

Electricity consumption and demand growth in South Africa has been higher than expected because of higher economic growth rates. Annual peak demand has grown on average by just more than 3.6% a year since 2000. Current peak electricity demand is actually lower than that predicted in Eskom's Integrated Strategic Electricity Plans, which were prepared in 2001, 2003 and 2005. Main causes of recent electricity supply failures are:

2.8.1 Policy uncertainty

Policy uncertainty between 1998 and 2004 inhibited and slowed investment. During this time there was a great competition between Eskom and private investment. In 2001, Eskom was prohibited by the government from building new generation capacity. This resulted in making the investment planning to be behind the schedule by 18 months. The policy uncertainty also delayed the re-establishment of dedicated

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project teams and departments in Eskom to manage the new capacity expansion programmes.

2.8.2 Poor co-ordination

The lack of co-ordination and integration of the different electricity planning, investment decision-making, approval and procurement processes between Eskom, National Energy Regulator of South Africa (Nersa). Emerging risks are also evident in the licensing delays by Nersa and the legal requirement for ministerial approval for any deviation from the official Nersa plan, which is already out of date.

2.8.3 Planning confusion

While there has been a great deal of planning, some of the earlier planning assumptions were wrong. The estimates for existing generation plant availability were too optimistic. It was assumed that municipalities would be able to contribute more generation capacity than is currently available. The assumed cost of unsaved energy was unrealistically low. And planning was constrained by applying too low a reserve margin (10% compared with a more acceptable 15%). Together these faulty assumptions have resulted in planned capacity additions that are 18 months to two years too late (FFC, 2002:34-36).

2.8.4 Inadequate maintenance or negligence

Inadequate maintenance or negligence may have played a hand. An investigation by NERSA concluded that, in the case of the Limpopo outages, there was negligence on the part of responsible Eskom personnel, maintenance procedures and remedial actions were inadequate, and protection systems had been operated incorrectly. Electrical network is presently facing considerable challenges. Electrical networks have been designed for the purpose of providing to the end consumer. The present electrical network is limited by the design and is unable to provide required development into smart grid (Fiil-Flynn, 2001:141). Thale (2004:21) mentioned that constrain on existing energy generation capacity and social pressure to replace or carefully manage aged existing infrastructure are further challenges in the South

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African energy market. With global trends showing on increase in the cost of producing energy, access to funding for this purpose becomes a serious challenge. Eskom is thus called upon to ensure that a significant revenue injection is available in order to build programmes for electricity that can be supported.

Mutale Local Municipality like many South African municipalities has its priority as speeding up community infrastructure with efforts to accelerate universal access to electricity. The demand for electricity for lighting has increased in all provinces with 80% of households in South Africa using electricity for lighting (Mutale Local Municipality 2010:6). The challenges facing South Africa and Eskom will therefore also affect Mutale Local Municipality. This is evident in the fact that the Municipality buys electricity form Eskom and supplies it to those areas for which it is licensed by the National Electricity Regulator (NER) to do so.

2.9 Small distributed generation can add significant capacity

Small-scale projects generate electricity near its demand in rural areas and thus avoid transmission losses and charges. The smaller investment they require also lowers the entry barriers, allowing more small-scale private developers to participate. This infusion of capital and entrepreneurship has been extremely successful in creating additional generation capacity. In India, the Ministry of New & Renewable Energy has been supporting the promotion of biomass power/cogeneration programs since the mid 1990s. A total of 167 biomass power and cogeneration projects, aggregating to 1400 MW capacity, have been installed for feeding power to the grid.

In addition, around 171 biomass power and cogeneration projects aggregating 1850 MW of electricity are in various stages of implementation. Cogeneration projects in sugar mills include 82 projects with installed capacity totaling 690 MW. Another 107 projects, aggregating 1280 MW, are being implemented. Thailand had a thriving small power producer program (SPP) and followed this success with a very small power producer (VSPP) program in which grid-connected distributed generation projects are profitably operated by private developers. A VSPP is defined as a generator with own generating unit, whose power generating process uses renewable energy sources, agricultural and industrial wastes and residues, or by-

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product steam, and who sells no more than 10 MW (as of December 2006) of electrical power directly to a distribution utility (the original 2002 VSPP regulations allowed net export of only 1 MW). The objective of the VSPP program is to promote participation of small generators in electricity generation and efficient use of domestic, environmentally friendly natural resources. VSPP generators receive higher tariffs during peak times. The VSPP regulations also provide for an additional FIT for specific renewable energy fuels.

The FIT is in addition to rates previously paid to VSPP generators and will be paid for the first seven years after each generator's commissioning date for all projects that were submitted before December 2008. The VSPP program streamlines procedures for small renewable energy generators to connect to the grid and guarantees both market and prices. The SPP and VSPP program together cover a wide range of capacity thereby ensuring that anyone who is interested can install a generator. The net metering for VSPP for sales to the grid of up to 10 MW per installation attracted the cost-effective biomass and combined heat- and power-based generators.

The project aimed at adding at least 10 MW of net-metered renewable energy in Thailand by the end of 2005, and it exceeded this goal, with 16 MW installed by September 2005.31 China also extended its electricity grids and exploited the country's hydropower and solar potential to achieve an electrification rate of 99.4 percent in 2009, with rural areas reaching 99 percent compared with 50.6 percent in 1975.32 In about 800 counties, (there are 1467 counties in mainland China), almost 80 percent of supply is met through small distributed renewable projects. Decentralization and a supportive investment climate attract a flood of private investments to the field of hydropower, thus greatly accelerating rural electrification. Around 300 million people in rural areas receive electricity through small, private-sector hydro projects.

The most remarkable achievement in this field is the success of the self-construction, self-management, and self consumption program in China where distributed generation from grid-connected small hydro plants is successfully meeting most of the rural demand in many provinces. By the end of 2008, 45,000 small hydropower

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stations had been installed having a combined capacity of 51 GW and supplying electricity to 300 million people in rural areas from hydropower sources. Thus, the electrification rate in rural hydropower areas increased from 40 percent in 1980 to 99.96 percent in 2008.33 Grid extension has always been favored in China's rural electrification, but recently, renewable energy technologies, both grid-connected and stand-alone, are perceived to be viable options for producing electricity.

The increasing difficulties in bringing electricity to the remaining villages by grid extension has led to questioning whether full grid coverage is economically justified compared with using cheaper decentralized off-grid options. Because the remaining 11.5 million citizens without electricity are difficult to reach through grid extension, the government intends to supply electricity to 10 million people by the end of 2020 by deploying decentralized power systems (China's Mid- and Long-Term Renewable Energy Development Plan, March 2008).

2.10 The non- grid electrification programme

Households in rural areas are typically sparsely settled, which makes the extension of grid networks to connect those areas economically unviable. The electrification programme would not be able to ensure grid electrification of all remote rural areas in the short or medium-term, therefore non-grid electrification was identified as an alternative. The non-grid electrification programme is designed to temporarily give deep rural community's access to limited electricity until such time that grid connections are possible. Solar Home Systems (SHS) are given to households as part of the non-grid electrification programme. A solar home system is an environmentally friendly technology and it involves low operation and maintenance costs. The solar home system is designed to serve one individual household. The basic solar home system to be used would comprise the following:

- A photovoltaic (PV) panel (50Wp),
- A charge controller,
- Wiring & outlets for small appliances
- A battery (105Amp-hour)

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- Energy efficient compact fluorescent lights (CFLs)

The solar home systems must satisfy the specification NRS 052 photovoltaic systems for use in individual homes. Deviations from this specification may be accepted, provided such deviations are clearly explained, reasons for the deviations given and support warranties issued. Experience from previous electrification projects in rural areas has shown that initially, customer use very little electricity. The main cause of low consumption is limited financial resources due to the poverty levels in the rural areas. The solar system allows for the use of a black and white television for four hours; four hours of quality lighting using high efficiency lights; the use of a portable radio for ten hours; and charging of cellphones. However, the thermal energy needs of solar off-grid customers, such as cooking, heating, ironing and refrigeration are not met. Other energy sources such as firewood and biomass, coal, paraffin, oil and liquid petroleum gas have to be used. Therefore one of the requirements of the Department of Energy is that the suppliers of non-grid technologies should augment their services by selling thermal fuels such as paraffin and Liquefied Petroleum Gas (LPG) to meet the cooking needs.

2.11 Household energy trends in developing countries

This section draws on the energy scholars and policy makers around the world who have devoted considerable effort to understanding household energy use in developing countries. In this section, the focus of attention will be on the energy ladder and fuel switching in developing countries. Household partial fuel switching is a temporary strategy, whereby a household switches to a new fuel, but continues to use the old fuel as well, whereas with complete fuel switching; the old fuel is not used at all (Kgathi et al., 1997:34). Complete household fuel switching is also known as an energy transition. The energy ladder is a scale, which rates the quality of household fuels (Chambwera, 2004:32).

It is important to understand these processes when investigating energy consumption patterns (Soussan et al., 1992:43). Understanding the process of energy transition in households will require research into why available electricity

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services are not used in poor urban areas. The work on household energy draws on the concept of an energy ladder with solid fuels on the lowest rung, and kerosene, LPG and electricity on successively higher rungs (Jack, 2004:7). According to Meikle and Bannister (2004:90) the energy ladder represents fuel types that might be used by households as their prosperity increases. The energy ladder fuel order corresponds with increased technological efficiency, decreased CO2, SO2 emissions and particles, and increased capital cost (Meikle and Bannister, 2004:23).

Davis (1998:9) argues that South Africa generally supports the notion that households climb the energy ladder, as they grow wealthier. Households that make use of electricity are more likely to use clean cooking fuels (Davis, 1998:45). Urban dwellers are more likely to use cleaner technology as their income grows (Hosier and Dowd, 1987:23; Campbell et al., 2003:45). Household energy types and consumption levels are determined by:

- Income
- Infrastructure
- Fuel availability
- Fuel prices
- Distribution network proximity
- Cultural preferences
- Demographic distribution
- Physical environment (urban or rural) (Davis, 1998:9).

The energy ladder studies by Leach (1992:34) and Smith et al. (1994:42) were based on the factors that determine the choice of fuel used and both studies concluded that the choice of fuel is determined by a particular household's personal choices and income. These studies argue that fuel switching in developing countries has been that households gradually ascend an 'energy ladder'. There is a tendency for a linear progression from relatively inefficient fuel and energy end-use equipment to a more efficient fuel, electricity and equipment, with increasing income levels and urbanization (Farsi et al., 2004:7).

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However, research into the energy consumption of households in developing countries shows that the energy ladder theory is simplistic. The results show that there are many factors other than income that determine fuel choice e.g. culture, social desirability and security of supply (Davis, 1998:9 and Bernett, 2000:90). Leach (1987:12) asserts that there is an energy transition process whereby households climb the ladder of fuel preferences. Recent studies conducted in South Africa have shown that as a result of the mass electrification programme the pattern of energy use has changed (Davis, 1998:88). Most urban households tend to switch to more extensive electricity use after being connected the electricity grid (Davis, 1998:88).

In a study in South Asia, Leach (1987:9) found that income, relative prices, the cost of appliances and the availability of modern fuels in urban areas were the most important variables affecting this transition process. In discussing the concept of an energy transition from low to high quality fuels, Soussan (1987:23) found that multiple fuel use and fuel switching were common in poor urban households and were the result of a specific budgeting strategy. The nature of fuel transition is also disturbed where households are faced with insecure energy supplies (Soussan et al., 1990:53). Under these circumstances, fuel security is the way that household energy is managed, and may prevent permanent energy transition (O'Keefe and Munslow, 1989:32).

Again, the state of the energy report for Cape Town 2003 states that households in Cape Town consume about 15 percent of total energy and 38 percent of total electricity (CCT and SEA, 2003:45). The rapid electrification since 1994 has meant that only eight percent of dwellings are currently not electrified. These are informal dwellings and backyard shacks. CCT and SEA (2003) states that low income households, whether electrified or not, are very much dependent on paraffin to meet their energy needs. Other fuels, such as wood and dung are popular amongst all households for specific activities such as braaing and brewing beer. Coal is used very little because it is expensive due to transport cost associated with it.

LPG gas is very little used amongst poor households due to poor access and perceptions that it is unsafe. However, middle to high-income households use electricity almost exclusively (CCT and SEA, 2003:12). This is a clear indication that

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households only manage to climb the ladder of fuel preferences once they can afford modern fuels. It can be argued that low-income households depend on multiple fuel use as fuel switching is difficult to achieve. Again, the nature of transition in these households is not well understood.

A growing body of literature on household energy use reveals that the energy transition does not occur as a series of simple, discrete steps but multiple fuel use is more common (Masera et al., 2000:12). In South Africa this transition has not been clearly defined, as diversity of energies has not declined in poor urban households (Madubansi and Shackleton, 2005:23).

Multiple fuel use has also been termed 'fuel stacking' (Masera et al., 2000:89). Although poor households often use several fuels simultaneously, they generally shift towards the adoption of cleaner, more efficient energy sources as income rise. Multiple fuel use arises for several reasons. First, households often have significant capital invested in 'traditional' technologies (e.g., wood-burning stoves) and may not have the spare capital to purchase new energy-consuming appliances immediately upon gaining access to new energy sources (Saghir, 2004:9). Second, modern energy sources are usually expensive and thus are applied carefully for unique services such as radios and television for entertainment (Thom, 2000:88). Thus, when new fuels arrive, traditional fuels and technologies tend to exit more slowly. Thus, modern transistor radios exist alongside primitive cooking stoves. Finally, multiple fuels can provide a sense of energy security. Complete dependence on commercially traded fuels leaves households vulnerable to variable prices and often unreliable service. Households in Hyderabad, India, for example, experience an average of two or three power outages each day (ESMAP, 1999:90).

The energy ladder and multiple fuels metaphor differ in the conception of precisely how energy sources are adopted. Both recognise that hierarchies in household energy services are quite common. According to Victor (2002:8) cooking and heating are the first functions fulfilled, followed by lighting and later entertainment. For the poorest people in developing countries, cooking (and space heating in particularly cold times) can account for upwards of 90 percent of the total volume of energy

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consumed. Lighting accounts for the majority of the remaining share (Howells et al., 2003:6).

Appliances such as electric irons, refrigerators and water heaters arrive in household energy budgets only after core heating, cooking and lighting services are satisfied (Victor, 2002:09). Thus, the first kilowatts of electricity acquired by households are commonly used for lighting, entertainment and communication services, while many households continue to cook and heat the home with traditional fuels long after modern energy enters the household (EIA, 2002:88; WEC/FAO, 1999:99).

Taste preferences and familiarity of cooking with traditional fuels and technologies contribute to the tendency of cooking to be the last energy service supplied by modern fuels. In India, for example, many wealthy households retain a biomass fuel stove for baking traditional breads (Malhotra et al., 2000:77). While in certain regions of Mexico even high-income households cook tortillas over an open wood fire rather than using an LPG stove because they prefer the taste and texture provided by wood cooking (Masera et al., 2000:90; Saatkamp et al., 2000:88).

2.12 Fuel switching and the energy ladder

On a theoretical level, an exploration of complex and diverse understanding of the energy ladder, which is crafted by income and lifestyle, clearly affects the energy transition in the developing world. In order to assess these realities, the final part of this chapter uses a theoretical framework as an analytical tool to accommodate the diverse energy demand in urban household of developing countries. The concept of a fuel switch or an energy transition is central to any understanding of the peri-urban and urban sector.

As urbanization proceeds, there is a tendency for household energy use to increase, diversify and switch from wood and charcoal to modern fuels. The key issue in this sector is the relative price and availability of different fuels and technologies. Where sustainable fuelwood supplies can be provided, they should be encouraged. However, there is little confidence in the potential of wood and charcoal as major long-term fuels. Energy transitions are not unidirectional; fuel shortages can

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encourage hoarding (i.e., stocking) or switching "downwards", from commercial fuel back to a tradition fuel (Chambwera, 2004:456).

Bensel and Remeda (1993:6) state that, generally speaking, the extents to which modern fuels have replaced wood fuels in a particular urban area have been determined by the size of the city and the level of economic development of the country involved. Household fuel switching may be a seasonal or short-term response to changes in supply, or a long-term measure. Bensel and Remeda (1993:7) also state that it is quite common for households with access to electricity to rely on coal or wood for cooking because of inadequate supplies, power cut or high electricity prices. The concept of an energy ladder, where people change to high-quality fuels and technologies based on growing income elasticity, is complicated in urban townships areas as energy-technology security is a key issue, not income elasticity to purchase commercial fuels (Chambwera, 2004:54).

In poor urban areas, wood are likely to be a market commodity and people are generally aware of the cost (in monetary terms) of their fuel (Chambwera, 2004:89). It is in such cases that fuel-efficient stoves are more likely to have an impact and fuel switching is likely to be higher priority, as well as more feasible. Keterere (1990:52) indicates that there are two essential criteria for fuel-switching to occur. Firstly, people must have sufficient income to be able to afford the asking price (both for the fuel and for the necessary equipment); secondly, the fuel supply must be maintained. Two issues are apparent, income and infrastructure. As individuals become wealthier, (assuming the infrastructure can maintain alternative fuel supply), fuel switching will occur.

There are a number of factors that work against a fuel switch. Paraffin is often seen as unsafe and a fire hazard; it is also seen as a "dirty" fuel which leaves prepared food with bad taste (Bensel and Remeda, 1993:29). If a household has had the experience of kerosene at an earlier stage, it can often prompt the same household to switch to another, higher on the energy ladder. However, the mitigating factor with kerosene is the ability to purchase it in small quantities, which is the major factor in explaining why people do use kerosene (Bensel and Remeda, 1993:52).

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Furthermore, it is suitable for two specific end-uses, namely lighting and boiling water for drinking.

In some parts of residential urban areas, the energy transition from wood to coal through kerosene, LPG and electricity has been seen in many different countries. This transition may be a slow or a rapid process. This transition will be patchy as different sectors of the residential urban zone use modern fuels, traditional fuels and a mix of fuels, depending on income and availability (Chambwera, 2004:76).

2.13 The criteria for non-grid electrification

Prior to providing non-grid electrification to certain areas, communities or households, the following conditions must be met:

- The lowest capacity grid supply cannot be supplied within the capital expenditure limit
- Non grid systems should not be installed within 2km from a grid line.
- Consider future grid electrification plans. The area falls outside of the 3 year grid plan.
- The identified areas must be included in the Municipal IDP.
- Eskom or licensed distributor in that area must confirm areas or households that would not receive grid electricity in the foreseeable future and grant permission that non-grid electrification be provided in those areas.
- A cost benefit analysis will also be considered to determine whether an area will be electrified via non-grid or not.

The cost of reticulation is extremely high in rural areas because there are no bulk infrastructure lines in most cases and the population density in deep rural areas makes grid electrification extremely uneconomical. The cost of supply must be compared against the lowest grid supply option available to more dense settlements.

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2.14 Conclusion

Every poor household is entitled to free basic electricity which is subsidized on a monthly basis. In 2003 a free basic electricity (FBE) policy was introduced to support the low-income households as a key strategy for improving availability and access to energy services for the poor. The FBE is offered to grid and off grid customers. According to the FBE policy, consumers to non-grid systems, installed through the INEP will receive a subsidy of up to 80% (or R48.00 per month) of the monthly service fee to provide access to non-grid systems, subject to the contractual obligations between the service provider and the consumer being met.

The implementation of FBE is the responsibility of the Municipality, making sure that poor households benefit from the subsidy. The provision of FBE is informed by the indigent policy of the respective Municipality. Municipalities therefore need to pay the FBE, as set out on the FBE policy, for the qualifying beneficiaries thus making sure that electricity is affordable and really benefits the poor. The next chapter deals with the research design and methodology.

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CHAPTER 3: RESEARCH DESIGN AND METHODOLOGY

3.1 Introduction

The aim of this chapter is to discuss the research design and the process of investigation based on the two research paradigms, namely the quantitative and the qualitative research paradigms (Leedy, 2004:89). A suitable research paradigm for this study was selected after the two paradigms were studied and discussed. A justification for the research paradigm chosen is provided. The data collection method including ethical measures is discussed. The procedure employed for data analysis is provided. In general, this chapter will illustrate an overall methodology together with the methods used to achieve the objectives of this research as stated in chapter one. It also describes the overall methodology adopted, population identification, sampling procedures and unit of analysis, the means to study site methods for data collection and analysis.

3.2 Study Area

The area of study will be Mutale Local municipality, All days Area under Makhado Walk In centre. The Thengwe Area has the following villages namely Mavunde, Ha-Rambuda, Masisi, Manenzhe, Muswodi and Matavhela.

3.3 Research Methodology

Research methodologies refer to the rationale and the philosophical assumptions that underlie a particular study (Leedy, 2004:23). This is therefore, informed by both quantitative and qualitative approaches. Philosophically, its arguments are underlined by inequalities of electricity services. This study is both quantitative and qualitative in nature and of necessity is that it will require careful description and evaluation of data. It involves a literature based on primary and secondary sources, supplemented by structured questionnaires administered to customers. Qualitative research is concerned with an assessment of a situation expressed in words (Manobe, 2001:104). It has to do with qualities rather than quantities or figures. It

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describes types, styles and similar factors in an effort to understand the phenomenon as a totality.

3.3.1 Quantitative research methodology

Quantitative research tends to be associated with measuring (Barnes, 1992:108). According to Good (1993:279) as well as Denzin and Lincoln (1994:4), quantitative studies emphasise the use of numerical measures to arrive at specific findings. Data collection in quantitative research is accumulated by means of inanimate instruments such as scales, tests, surveys, questionnaires and computers (Storbeck, 1994:73). Creswell (1994:4) is of the opinion that because quantitative research is impersonal and experimental it is not suitable to study human phenomenon.

Quantitative research methods include the implementation of statistics to measure data. Statistics, according to Leedy (1993:244), are a very simple matter but are a powerful tool in the hands of the researcher who is able to view their nature and interrelationships more understandably. Through statistics, therefore the researcher is able to conceptualize what otherwise might be incomprehensible (Leedy, 1993:244) hence the advantages of this study. The facts gathered from questionnaires were translated into tabular from. This was done so that the facts (statistics) would speak more clearly.

3.3.2 Qualitative research methodology

De Vos (2001:240) defines qualitative research as a multi-perspective approach making sense of interpreting or reconstruction this interaction in terms of meanings that the subjects attach to it. This approach deals with data that are principally verbal. It is the approach in which the procedures are not as strictly formalized as in quantitative research and the scope is more likely to be undefined and a more philosophical mode of operation is adopted. It aims at understanding and interpreting the meanings and intentions that underlie everyday human action. Qualitative researchers maintain that many natural properties cannot be expressed in quantitative terms; they will lose their reality if expressed simply in terms of frequency (Kincheleo, 1991:143).

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Qualitative methodology refers to research which produces descriptive data: generally no numbers or counts are assigned to observations. The indispensable condition or qualification for qualitative methodology is a commitment to seeing the world from the point of view of the actor (the participant). Because of this commitment to see through the eyes of one's subjects, close involvement is advocated (Bryman, 1984:78).

Creswell(1998:12) states that it is clear that in qualitative research one gets closer to the people, talks to them and tries to get into their subjective feelings to understand the reasons why they do what they do. Reality is, therefore, subjective and one seeks to understand phenomena. Concepts are in the form of themes, motifs and categories. The research design is therefore flexible. Inductive logic is employed in the quest to derive meaning from subjects. These are meanings people attach to everyday life. Applied qualitative methodologies allow the researcher to know people personally and to see them as they are, to experience their daily struggles when confronted with real situations. Using a qualitative research methodology, the researcher interprets and describes the actions of people when confronted with life situations.

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Based on the qualitative research methodology, the researcher designed and compiled semi-structured interview questions in order to collect information from Muswodi community. In this regard information was collected through the use of questionnaires. The qualitative research methodology was used because it provides a framework for a subject to speak freely out in his or her own terms about a case which the researcher brings to the interaction.

3.4 Population

Donald and Pamela (2003:78), defined population as the group upon which the researcher is interested in making inferences. Population is defined as a set of entities in which all the measurements of interests to the practitioner or researcher are presented. The target population will be from municipality officials (Community Services Section), ESKOM customers, Traditional leader and Eskom Officials. The population in this study is made of 3500 including ESKOM customers, municipal

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officer, ward committee,Traditional leader and Thohoyandou Eskom in the Mutale Municipality.

3.5 Sampling

Wimmer and Dominick (1983:58) mentioned that a sample that is not representative of population, regardless of its size, is inadequate for testing purposes-the results cannot be generalised for the population. The participant will be selected through the use of purpose sampling technique. Participants will be civic members, traditional leaders, community development workers, business people, ward councillors as well as energy forum members from Muswodi village who are using electricity provided by Eskom.

3.6 Sampling methods

According to Saunders, Lewis and Thornhill (2000:150), sampling method provide a wide range of methods that enable the researcher to reduce the amount of data needed to collect by considering only the data from sub-group rather than all possible cases. Purposive sample was used for selection of a sample population. Simple random and purposive samplings are used in different contexts for the selection of a population sample. In this study purposeful method of sampling will be used so that individuals are selected because they have experienced the central phenomenon.

A purposive sampling technique was employed in selection study participants. All participants in this study already meet the requirements and characteristics that the researcher needs as they are serving in different structures. In simple random sampling, every member of the population has an equal chance of being selected. For this research a random sample will be used in Muswodi village to specifically those who are using Eskom Electricity.

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3.7 Sample Size

When choosing a sampling size, practical consideration like time and cost should be taken into account. Maree (2009:179), indicated that there are things that may be looked at for the researcher as possible ways to reduce the cost, that is sample size, method of data collection, population, accuracy and statistical analysis. The number of customer to be interviewed will be ten which are based at Mutale village.

Table 3.1: Sampling size of the study

TARGET	STUDY POPULATION	STUDY SAMPLE
ESKOM Customers	500	20
ESKOM Staff	33	23
Local authorities	2	2
Traditional leaders	5	5
Total	**540**	**50**

3.8 Methods of data collection

For the purpose of this research both interview and questionnaires will be used. The interview will be open ended so that the customer will be given a chance to explain their side. A letter requesting permission to collect data from the customers at Mutale Local Municipality will be submitted to the Eskom Customer Relation Manager from Thohoyandou customer services to allow the researcher to do research at the village. Questionnaires will be developed and conducted individually to the identified participants. Data collection will be conducted through questionnaire which will also need explanation.

3.8.1 Questionnaire

A questionnaire is also to be used. A questionnaire is list of pre-set questions that enables respondents to answer questions. These questions are open-ended and

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therefore the respondent can reply his/her own words (Stone and Harris, 1984:9). According to Collis and Hussey (2003), questionnaires are associated with both positivistic and phenomenological methodologies. They also describe a questionnaire as a list of carefully structured questions, chosen after considerable testing, with a view to eliciting reliable responses from a chosen sample.

The main aim of a questionnaire, according to Collis and Hussey (2003:173), is to find out what a selected group of participants do, think or feel. Delport (2005:166) concurs with Collis and Hussey (2003) in that the basic objective of a questionnaire is to obtain facts and opinions about a phenomenon from people who are informed on the particular issue. Babbie and Mouton (2001:233) express the view that although the term 'questionnaire' suggests a collection of questions, a typical questionnaire will probably contain as many statements as questions, especially if the researcher is interested in determining the extent to which respondents hold a particular attitude or perspective. There are also different types of questionnaires as are described in Delport (2005:167) as follows:

3.8.2 Interviews

Collis and Hussey (2003:167) state that interviews are a method of collecting data in which selected participants are asked questions in order to find out what they do, think or feel. They acknowledge that interviews are associated with both positivist and phenomenological methodologies. Schwandt (2007:163) classifies interviews as either structured (closed, forced-choice responses) or unstructured (open-ended responses). Collis and Hussey (2003:88) suggest unstructured interviews are suitable for a phenomenological (qualitative) approach, which this study has adopted. According to Easterby-Smith, Thorpe and Lowe (1991), unstructured or semi-structured interviews are an appropriate method when:

- It is necessary to understand the construct that the interviewee uses as a basis for his or her opinions and beliefs about a particular matter or situation.

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- One aim of the interview is to develop an understanding of the respondent's 'world' so that the researcher might influence it, either independently or collaboratively
- The step-by-step logic of a situation is not clear.
- The subject matter is highly confidential or commercially sensitive.
- The interviewee may be reluctant to be truthful about this issue other than confidentially in a one-on-one situation.

Questionnaire will be given to the Eskom Area manager in Thohoyandou Area to correct them.

3.9 Method of data analysis

Miles & Huberman (1994:90) state that data anlyses is the process of systematically searching and arranging the interview transcription, field note, and other materials that are accumulated to increase the researcher's own understanding of them and to enable one to present what one has discovered.

The data analysis will be grouped into categories. An analysis will be done using Statistical Package Social Sciences (SPSS) immediately after the data has been collected and after the results will be interpreted in order to generate research report. The results will be presented in the form of tables and percentages. A brief discussion representing tables will be given to summarize the whole data.

3.10 Ethical Considerations

Bell (1993:88) advises that permission to carry out an investigation must always be sought at an early stage. Since the researcher is employed by the Eskom Southern Region it will be easy to obtain permission to use the company as a case for this research study. It was established that the research process would not harm any of the participants or any of those about whom information was to be collected. The opinion survey questionnaire that will be send out to participants will be

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accompanied by an explanation of the purpose of the research. The same will be done when documents are requested from the company for this study.

The purpose of the study is also explained to those who will ask to participate in the personal interviews. It is the view of the researcher that, in conducting the research, no accepted research practices were violated. Confidentiality/anonymity will guaranteed to participants who will be responding to the opinion survey questionnaire. Inputs from both the questionnaire respondents and the interviewees will be treated with equal dignity. It is also the researcher's view that at no time, during the course of the research, would any of Eskom's standards of conduct have been violated.

3.10.1 Protection from harm

In cases where the nature of a study involved creating a small amount of psychological discomfort, participants, would know about it ahead of time, and any necessary debriefing or counseling followed immediately after their participation.

3.10.2 Informed consent

Participants were told in advance about the nature of the study to be conducted, and be given the choice of either the right to withdraw from the study at any time, as participation in a study should be strictly voluntary. It was suggested that an informed consent form that describes the nature of research as well the nature of the required participation be presented to participants in a research study. Such a form according to Leedy & Ormrod (2001:108) contained the following information:

- A brief description of the nature of the study.
- A description of what participation will involve in terms of activities and duration.
- A statement indicating that participation is voluntary and can be terminated at any time without penalty.
- A list of potential risk and/or discomfort that participants may encounter.

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- The guarantee that all responses will be kept confidential and anonymous.
- The researcher's name, plus information about how the researcher can be contacted.
- An individual or office that participants can contact, should they have questions or concerns about the study.
- An offer to provide detailed information about the study (e.g., a summary of findings) upon its completion.
- A place for participants to sign and date the consent form, indicating agreement to participate.

3.10.3 Right to privacy

The research project respected participants' right to privacy. In general, a researcher kept the nature and quality of participants' performance strictly confidential.

3.10.4 Honesty with professional colleagues

Researchers reported their findings in a complete and honest fashion, without misrepresenting what they have done or intentionally misleading others as to the nature of their findings. Under no circumstances could a researcher fabricate data to support a particular conclusion, no matter how seemingly 'noble' that conclusion may be.

3.11 Conclusion

This chapter has covered all issues concerning overall research methodology adopted, population identification, sampling procedures and units of analysis, the means of access to study sites and methods for data collection and analysis. The issue of how data were collected and analysed were dealt with in this chapter. The next chapter deals with the interpretation and analysis of the collected data.

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CHAPTER 4: DATA PRESENTATION, INTERPRETATION AND ANALYSIS

4.1 Introduction

The previous chapter focused on the research methodology and on how the research was conducted. In this chapter, the findings of the study are discussed. The aim of this study was to gain a deeper understanding of institutional capacity of electricity supply services for rural communities in Mutale Local Municipality of Limpopo province. As discussed in the previous chapters, data for this study was collected by means of field observation and questionnaires. The data was then transcribed and analysis was done by means of content data and statistical analysis. Categories and themes emerged throughout the analysis process.

4.2 Biographical information of the respondents

Table 4.1: gender status of the respondents

	Frequency	Percentage
Male	23	46
Female	27	54
Total	**50**	**100**

Out of the 30 responses the observations made were that 23 were males and 27 were females which constitute 54% (See table 4.1). This means that males were in majority and the two local municipalities had to recruit more females to participate in ward committee structures and municipal governance. In addition, the 50/50 male and female ratio as required in terms of Project Consolidate is not yet achieved by the municipalities.

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Table 4.2: Language used by the respondents

	Frequency	Percentage
English	0	0
Tsonga	20	40
Tshivenda	30	60
Total	**50**	**100**

The 30 respondents which constitutes 60 percent of total sample spoke Tshivenda their mother tongue while 40 percent of the total sample spoke Tsonga and used the same language as medium of communication in meetings (See table 4.2).

Table 4.3: Employment status of the respondents

	Frequency	Percentages
Full time	6	12
Part time	7	14
Unemployed	31	62
Pensioner	6	12
Total	**50**	**100**

In terms employment status the majority of the ward committee members were unemployed, that is, 62%. Ironically, 25% of the respondents were employed although the majority of this category was employed on a part-time (i.e. 14% and 12% full-time employed). In addition, pensioners constitute 12% of the total number of respondents (See Table 4.3).

Table 4.4: Educational information of the respondents

	Frequency	Percentages
Below matric	19	48
Matric	10	20
Diploma	11	22
Degree	5	10
Total	**50**	**100**

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The responses from the respondents have shown that the majority (55%) had no matriculation certificates. Only 20% of the respondents had passed Matriculation exams, and those that have diplomas constituted 22% and those with degrees made 10% of the total number of respondents (See Table 4.4). However, 14% of the respondents did not respond on the question which could be because they did not understand the question or had no education at all.

4.3 Analysis of Quantitative data

Table 4.5: There is a poor distribution of electricity by ESKOM in Mutale Local Municipality

	Frequency	Percentage
Strongly agree	29	58
Agree	5	10
Uncertain	4	8
Strongly Disagree	7	14
Disagree	5	10
Total	**50**	**100**

Table 4.1 reveals that 34 respondent who constituted 68% of the total sample agreed that there is poor distribution of electricity by ESKOM in Mutale Local Municipality the problem which could be based on the fact that the majority of the people are poor and that could be a strong deterrent on the side of the municipality in terms of revenue. On the contrary 12 respondent constituting 24% of the total sample disagreed while 4 respondent constituting 8% of the total sample was uncertain and these could be based on the lack of information by the majority of the people in the community

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Table 4.6: Poor distribution of electricity causes illegal electricity connection

	Frequency	Percentage
Strongly agree	26	52
Agree	4	8
Uncertain	5	10
Strongly Disagree	10	20
Disagree	5	10
Total	**50**	**100**

Table 4.2 reveals that 30 respondents who constituted 60% of the total sample agreed that poor distribution of electricity causes illegal electricity connection and this could be due to the fact that many people in Mutale Local Municipality were unable to pay electricity and the mounting arrears could have led to electricity cut-offs. The fact that 15 respondent who constituted 30% of the total sample disagreed could eventually confirm misconception on the side of respondent who were in the minority. Ignorance could not be completely ruled completely amongst respondent as that was confirmed by 5 respondent who constituted 10% of the total sample who were uncertain as to whether poor distribution of electricity causes illegal electricity connection

Table 4.7: Low income generation causes poor distribution of electricity

	Frequency	Percentage
Strongly agree	22	44
Agree	7	14
Uncertain	3	6
Strongly Disagree	8	16
Disagree	10	20
Total	**50**	**100**

ESKOM as a business company wants to generate profit and ESKOM would prefer to speed distribution were in come generation could be faster. This notion is well

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corroborated by table 4.3 in which 29 respondent who constituted 58% of the total sample agreed that low income generation causes poor distribution of electricity. It must be noted however that ESKOM is primary objective is to generate profit and in instance where the generation of income is low there could be poor distribution of electricity by ESKOM. Against the above background 18 respondent who constituted 36% of the total sample disagreed that low income generation cause poor distribution of electricity while 6% of the total sample were uncertain, something which could have its basis on the lack of information

Table 4.8: There is a back log of electricity supply in Mutale Local Municipality

	Frequency	Percentage
Strongly agree	24	48
Agree	8	16
Uncertain	4	8
Strongly Disagree	8	16
Disagree	6	12
Total	**50**	**100**

Table 4.4 shows that 32 respondent who constituted 64% of the total sample agreed that there is a serious back log of electricity supply in Mutale Local Municipality. The back log mentioned could be necessitated by rapid demographic change and incapacity by municipality. The same table further reveals that 14 respondent who constituted 28% of the total sample disagreed that there is a back log of electricity supply in Blouberg Municipality the notion which could be based on the lack of knowledge of the dynamics of the municipality. Dynamics by the relevant respondents and no wonder why its respondent who constituted 8% of the total sample was uncertain. It could be because of the lack of knowledge by those respondents.

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Table 4.9: The Mutale Local Municipality is totally failing to provide electricity to its citizens

	Frequency	Percentage
Strongly agree	10	20
Agree	9	18
Uncertain	7	14
Strongly Disagree	15	30
Disagree	9	18
Total	**50**	**100**

Table 4.5 shows that 24 respondent who constituted 48% of the total sample disagreed that the Mutale Local Municipality is totally failing to provide electricity to its citizens. Those who disagreed are in the majority and this could be the fact that the municipality mentioned was attempting to distribute electricity through ESKOM though there were some back log, but contrary to that 19 respondent who constituted 38% of the total sample agreed that the municipality is totally failing to provide electricity to its citizen, something which could have its basis on the fact that the respondents knew very little about the rural areas neighboring Mutale Local Municipality. 7 respondents were uncertain about the distribution of electricity in Mutale Local Municipality.

Table 4.9: Electricity cut-offs is prevalent in Mutale Local Municipality

	Frequency	Percentage
Strongly agree	25	50
Agree	8	16
Uncertain	4	8
Strongly Disagree	7	14
Disagree	6	12
Total	**50**	**100**

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Table 4.6 reveals that 33 respondent who constituted 66% of the total sample agreed that electricity cut-offs is prevalent in Mutale Local Municipality the idea which could have its basis on the fact that many people were unable to pay electricity and the mounting arrears eventually could lead to electricity cut-offs by ESKOM. On the other hand 13 respondent who constituted 26% of the total sample disagreed that electricity cut-offs is prevalent in Mutale Local Municipality. In view of this statement it is clear that the respondents could have little knowledge about the electricity cut=offs and that view was also shared by 4 respondents constituting 8% of the total sample who were uncertain about the electricity cut-offs

Table 4.10: There is inadequate maintenance of electricity.

	Frequency	Percentage
Strongly agree	23	46
Agree	5	10
Uncertain	4	8
Strongly Disagree	8	16
Disagree	10	20
Total	**50**	**100**

In view of table 4.7 above 28 respondents who constituted 56% of the total sample agreed that there is an inadequate maintenance of electricity in Mutale Local Municipality something which could have been necessitated by lack of resources. Against the above background 18 respondents constituting 36% of the total sample disagreed while 4 respondents who constituted 8% of the total sample were uncertain about the maintenance of electricity in Mutale Local Municipality. It must be noted that some people know very little about the electricity maintenance in Mutale Local Municipality, so it would not surprise as to see people responding that way.

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Table 4.11: There is negligence on the part of responsible ESKOM personnel

	Frequency	Percentage
Strongly agree	20	40
Agree	11	22
Uncertain	4	8
Strongly Disagree	9	18
Disagree	6	12
Total	**50**	**100**

Table 4.8 reveals that 31 respondent who constituted 62% of the total sample agreed that there is negligence on the part of the responsible ESKOM personnel, is respondents who constituted 30% of the total sample disagreed while 8% of the total sample respondents are uncertain. The above scenario could draw the conclusion that indeed ESKOM personnel were negligence in Mutale Local Municipality something which could have been necessitated lack of strategy by the relevant personnel.

Table 4.12: Maintenance procedure and remedial actions were adequate

	Frequency	Percentage
Strongly agree	10	20
Agree	9	18
Uncertain	5	10
Strongly Disagree	14	28
Disagree	12	24
Total	**50**	**100**

Table 4.9 reveals that 26 respondents who constituted 52% of the total sample disagreed that maintenance procedure and remedial action were adequate on the contrary 19 respondents who constituted 38% of the total sample agreed that maintenance procedure and remedial actions were adequate while 5 respondents who constituted 10% of the total sample were uncertain. The three divergence views

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could bring the conclusion that maintenance procedure and remedial actions were indeed not adequate.

Table 4.13: Community use gas as a source for the domestic purposes

	Frequency	Percentage
Strongly agree	5	10
Agree	5	10
Uncertain	5	10
Strongly Disagree	5	10
Disagree	30	60
Total	**50**	**100**

Table 4.9 reveals that 35 respondents which constituted 70% of the total sample disagreed that community used gas for domestic purpose, the idea which could be based on the fact that the majority of the people were poor and in most cases they used firewood for cooking. 5 respondents who constituted 10% of the total sample was uncertain of whether community used firewood for cooking; or not something which could be based on the lack of information of the community members concerned. The fact that 10 respondents which constituted 20% of the total sample agreed that community use gas for domestic purpose clearly confirms lack of information to a certain section of the community.

Table 4.14: People use paraffin for cooking.

	Frequency	**Percentage**
Strongly Agree	33	66
Agree	4	8
Uncertain	0	0
Disagree	8	16
Strongly disagree	5	10
Total	**50**	**100**

Table 4.14 shows that 66% used paraffin for cooking, while 16 % of the participants disagreed with the idea .66% strongly disagreed while 8% of the respondents agreed

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with the statement, and this indicates that the majority of the respondents have problem of electricity.

Table 4.15: People use firewood for cooking.

	Frequency	Percentage
Strongly Agree	32	64
Agree	3	6
Uncertain	4	8
Disagree	7	14
Strongly disagree	5	10
Total	**50**	**100**

Table 4.12 reveals that 70% of the respondents strongly agreed that people use firewood for cooking while 14 %disagreed whereas 10%stronly disagreed. 8% of the respondents were uncertain meanwhile 7% of people agreed that they use firewood for different domestic purposes. The 10%of the respondents who strongly disagreed could be those who had electricity.

Table 4.16: Electricity supply is a problem in the village.

	Frequency	Percentage
Strongly Agree	35	70
Agree	3	6
Uncertain	2	4
Disagree	1	2
Strongly disagree	9	18
Total	**50**	**100**

According to table 4.16 the majority of the respondents strongly agreed that electricity supply is a problem in the village and this suggest that the majority of the respondents did not have electricity. 20% of the respondents strongly disagreed that there was a problem of the electricity supply in the village and this could be because of the fact that they have electricity at home so there is no problem with the supply of electricity to their homes 70% of the respondents agreed that there was indeed a

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problem in the electricity supply while 2% of the respondents disagreed and moreover 4% were uncertain and this could be the problem of lack of information around those respondents

Table 4.17: Other people do have electricity while others don't.

	Frequency	Percentage
Strongly Agree	35	70
Agree	7	14
Uncertain	5	10
Disagree	3	6
Strongly disagree	0	0
Total	**50**	**100**

Table 4.16 reveals that 70 % of the respondents and other people did have electricity while others didn't have while 6% of the respondents disagreed this is a clear indication the majority of the people did not have electricity the 10 percent of the respondents were unsure and this could be based on ignorance 6% of the respondents disagreed while 14 % agreed and in view of this percentage one could conclude that the majority of the respondents did not have electricity

Table 4.18: Electricity is an issue in this village.

	Frequency	Percentage
Strongly Agree	36	72
Agree	3	6
Uncertain	2	4
Disagree	5	10
Strongly disagree	4	8
Total	**50**	**100**

Table 4.18 indicates that electricity was an issue in this village as revealed by 72% of the respondents' who strongly agreed that electricity was a very serious issue here. In view of the opinion of the respondents it was clear that electricity could be the real issue. The fact that 10% disagreed and 8% strongly disagreed could be the fact that

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very few people had electricity in this village. The 4% of the respondents who were uncertain revealed the ignorance of the people in the community.

Table 4.19: Solar energy is another source of energy.

	Frequency	Percentage
Strongly Agree	35	70
Agree	6	12
Uncertain	2	4
Disagree	3	6
Strongly disagree	4	8
Total	**50**	**100**

Table.4.19 shows that 70% of the respondents used solar as a source of energy. The fact that 14% disagreed and strongly disagreed could be the fact that certain people were indeed ignorant in the community. The agreement by 4% of respondents corroborated with the idea that indeed solar was source energy.

Table 4.20: Financial constrain is another serious problem to those who have electricity.

	Frequency	Percentage
Strongly Agree	33	66
Agree	5	10
Uncertain	5	10
Disagree	4	8
Strongly disagree	3	6
Total	**50**	**100**

Table 4.20 reveals that 66% of the respondents agreed that financial constrain was a serious problem to those who had electricity. This could be possible due to poverty which affects the majority of the people in the area. The fact that 14% of the respondents disagreed and strongly disagreed reveals that the minority of the people had electricity. The agreement by 10% reveals that indeed financial constrain was a serious issue and it corroborated well in this passage while 10 % of the respondents

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who were uncertain confirmed the ignorant of another section of the people in the community.

Table 4.21: Poor maintenance of electricity supply system causes shortage of electricity.

	Frequency	Percentage
Strongly Agree	31	62
Agree	4	8
Uncertain	3	6
Disagree	7	14
Strongly disagree	5	10
Total	**50**	**100**

Table.4.21 shows that 62% of the respondents strongly agree that poor maintenance of electricity supply system causes shortage of electricity. Although 14% of the respondents were unsure of the prevailing developments in the area, the issue of poor maintenance was also corroborated by 8% of the respondents who agreed that indeed poor maintenance of electricity supply system causes shortage of electricity. 13% 0f the respondents who strongly disagreed and 10% who disagreed could be because of the fact that those respondents did not have any problem of electricity at all.

Table 4.22: Wood collection is another form of saving electricity.

	Frequency	Percentage
Strongly Agree	32	64
Agree	5	10
Uncertain	3	6
Disagree	5	10
Strongly disagree	5	10
Total	**50**	**100**

Table 4.22 reveals that 64% of the respondents strongly agreed that wood collection was another form of saving electricity and this was also corroborated by 10% of the

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respondents who also agreed that indeed wood collection is an alternative of saving electricity. The 10% of the respondents who strongly disagreed and at the very same time disagreed shows that a certain section of the community had access to electricity and they had no problem whatsoever to pay electricity bills.

4.4 Qualitative data interpretation and analysis

An open-ended structured questionnaire was used. This was meant to allow respondents to bring out as much information as possible as compared to a closed questionnaire, which allows respondents to choose between predetermined responses (Schumacher and McMillan, 1993). Furthermore, open-ended questionnaires were preferred because they offer respondents the opportunity to freely respond according to their own views, experiences and feelings. Open-ended questionnaires accommodate a discussion on the answers so as to find out why the particular respondents give those specific answers.

4.4.1 Non- grid electrification programme

Respondent 1 shows that:

Households in rural areas are typically sparsely settled, which makes the extension of grid networks to connect those areas economically unviable. The electrification programme would not be able to ensure grid electrification of all remote rural areas in the short or medium-term, therefore non-grid electrification was identified as an alternative. The non-grid electrification programme is designed to temporarily give deep rural community's access to limited electricity until such time that grid Connections are possible.

Respondent 2 indicates that:

"Solar Home Systems (SHS) are given to households as part of the non-grid electrification programme". A solar home system is an environmentally friendly technology and it involves low operation and maintenance costs. "The solar home system is designed to serve one individual household".

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The solar home systems must satisfy the specification NRS 052 photovoltaic systems for use in individual homes. Deviations from this specification may be accepted, provided such deviations are clearly explained, reasons for the deviations given and support warranties issued.

Respondent 3 reveals that:

Experience from previous electrification projects in rural areas has shown that initially, customer use very little electricity. The main cause of low consumption is limited financial resources due to the poverty levels in the rural areas.

Respondent 4 reveals that:

The solar system allows for the use of a black and white television for four hours; four hours of quality lighting using high efficiency lights; the use of a portable radio for ten hours; and charging of cell-phones. However, the thermal energy needs of solar off-grid customers, such as cooking, heating, ironing and refrigeration are not met.

Other energy sources such as firewood and biomass, coal, paraffin, oil and liquid petroleum gas have to be used. Therefore one of the requirements of the Department of Energy is that the suppliers of non-grid technologies should augment their services by selling thermal fuels such as paraffin and Liquefied Petroleum Gas (LPG) to meet the cooking needs.

4.4.2 The funding model: Fee-for-service model

Respondent 1 reveals that:

The funding model currently used in the programme is the fee-for-service model. This model eliminates a capital cost to the customer, who is often poor. The initial investment is not borne by the end user but by the concessionaire or service provider. Furthermore, the maintenance of the system is not borne by the end user, but by the concessionaire or service provider.

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Respondent 2 reveals that:

The service provider will charge households an affordable fee for services, including maintenance of the systems. In essence, the utility co-owns the equipment with the Department and the customer pays for the service. The service provider charges a monthly fee to households and is responsible for the service. The ESCOs buy solar PV systems in bulk, installs the solar home system, and bills for services rendered.

Respondent 3 indicates that:

Subsidies are essential for increasing rural electrification access to the poor. However, subsidies should be temporary in nature and be evaluated on a regular basis.

The Department will subsidize the provision of non-grid solar home systems. Only 80% of the total capital cost of the system will be subsidized. The service provider will pay the remaining 20% of the capital cost.

Respondent 4 shows that:

Every poor household is entitled to free basic electricity which is subsidized on a monthly basis. In 2003 a free basic electricity (FBE) policy was introduced to support the low-income households as a key strategy for improving availability and access to energy services for the poor. The FBE is offered to grid and off grid customers.

According to the FBE policy, consumers to non-grid systems, installed through the INEP will receive a subsidy of up to 80% (or R48.00 per month) of the monthly service fee to provide access to non-grid systems, subject to the contractual obligations between the service provider and the consumer being met.

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Respondent 5 indicates that:

The implementation of FBE is the responsibility of the Municipality, making sure that poor households benefit from the subsidy. The provision of FBE is informed by the indigent policy of the respective Municipality.

Municipalities therefore need to pay the FBE, as set out on the FBE policy, for the qualifying beneficiaries thus making sure that electricity is affordable and really benefits the poor.

4.4.3 Re-use of deinstalled solar home systems

Respondent 1 indicates that:

There have been instances where systems have been removed/ deinstalled from households due to continuous non-payment of the monthly service fee by the end-users and due to grid encroachment. Grid encroachment refers to cases where grid infrastructure/ the network have reached areas where non-grid infrastructure (SHS) has been provided to households as a temporary measure for electricity.

As such, households would then be connected to the grid. In cases of grid encroachment, the local licensed utility is liable for the cost of deinstalling the solar home systems. The number of deinstallations should be included in the reports submitted to DoE and the Municipality. Should deinstalled systems be used in other non-grid areas, this should also be reported to the Department as this has direct cost implications on the programme's budget

4.4.4 Household energy trends in Mutale Local Municipality

Respondent 1 indicates that:

Household partial fuel switching is a temporary strategy, whereby a household switches to a new fuel, but continues to use the old fuel as well, whereas with complete fuel switching; the old fuel is not used at all.

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Complete household fuel switching is also known as an energy transition. The energy ladder is a scale, which rates the quality of household fuels

Respondent 2 indicates that:

It is important to understand these processes when investigating energy consumption patterns. Understanding the process of energy transition in households will require research into why available electricity services are not used in poor urban areas. The work on household energy draws on the concept of an energy ladder with solid fuels on the lowest rung, and kerosene, LPG and electricity on successively higher rungs

Respondent 3 shows that:

"the energy ladder represents fuel types that might be used by households as their prosperity increases". The energy ladder fuel order corresponds with increased technological efficiency, decreased CO2, SO2 emissions and particles, and increased capital cost.

Respondent 4 indicate that:

South Africa generally supports the notion that households climb the energy ladder, as they grow wealthier. Households that make use of electricity are more likely to use clean cooking fuels. Urban dwellers are more likely to use cleaner technology as their income grows.

Respondent 4 indicates that:

Income, relative prices, the cost of appliances and the availability of modern fuels in urban areas were the most important variables affecting this transition process. In discussing the concept of an energy transition from low to high quality fuels,

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"multiple fuel use and fuel switching were common in poor urban households and were the result of a specific budgeting strategy". The nature of fuel transition is also disturbed where households are faced with insecure energy supplies

Respondent 6 indicate that:

LPG gas is very little used amongst poor households due to poor access and perceptions that it is unsafe. However, middle to high-income households use electricity almost exclusively. This is a clear indication that households only manage to climb the ladder of fuel preferences once they can afford modern fuels.

It can be argued that low-income households depend on multiple fuel use as fuel switching is difficult to achieve. Again, the nature of transition in these households is not well understood.

4.4.5 Cost of electricity Unit

Most of the people being interviewed complained about the cost of a unit of electricity. The price of electricity goes up once or twice every year. Most of them cannot afford to purchase enough electricity units to meet their energy needs. Many of them are even paying more because of the arrears that are appearing on their accounts, sometimes still carried over from the apartheid era. Residents from Mutale Local Municipality buy their electricity units directly from Eskom, while residents from Mutale Local Municipality get their electricity services from Mutale Local Municipality. Since Mutale Local Municipality buys electricity in bulk from Eskom and sells it to the residents with a mark up, this makes the price of electricity different in the two respective areas.

Residents in Mutale Local Municipality are paying more for a unit than residents in city, yet they are neighbouring townships divided by a street. The difference between prices varies from 9 cents to 15 cents. In addition to that, residents pay more for a unit of electricity than industries that are situated even close to the two residential

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areas. According to the Eskom official, this happens due to the fact that industries use large volumes of electricity and thus receive discounted rates

4.4.6 Fuel switching and the energy ladder

Respondent 1 revealed that: As urbanization proceeds, there is a tendency for household energy use to increase, diversify and switch from wood and charcoal to modern fuels. The key issue in this sector is the relative price and availability of different fuels and technologies. Where sustainable fuel-wood supplies can be provided, they should be encouraged.

Respondent 2 indicate that:

However, there is little confidence in the potential of wood and charcoal as major long-term fuels. Energy transitions are not unidirectional; fuel shortages can encourage hoarding (i.e., stocking) or switching "downwards", from commercial fuel back to a tradition fuel.

Respondents 3 indicates that

Generally speaking, the extents to which modern fuels have replaced wood-fuels in a particular urban area have been determined by the size of the city and the level of economic development of the country involved. Household fuel switching may be a seasonal or short-term response to changes in supply, or a long-term measure.

Respondent 4 revealed that:

"it is quite common for households with access to electricity to rely on coal or wood for cooking because of inadequate supplies, power cut or high electricity prices". The concept of an energy ladder, where people change to high-quality fuels and technologies based on growing income elasticity, is complicated in urban townships areas as energy-technology security is a key issue, not income elasticity to purchase commercial fuels.

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Respondent 5 shows that:

"poor urban areas, wood are likely to be a market commodity and people are generally aware of the cost (in monetary terms) of their fuel". It is in such cases that fuel-efficient stoves are more likely to have an impact and fuel switching is likely to be higher priority, as well as more feasible.

Respondent 6 indicates that:

"there are two essential criteria for fuel-switching to occur". Firstly, people must have sufficient income to be able to afford the asking price (both for the fuel and for the necessary equipment); secondly, the fuel supply must be maintained. Two issues are apparent, income and infrastructure. As individuals become wealthier, (assuming the infrastructure can maintain alternative fuel supply), fuel switching will occur.

There are a number of factors that work against a fuel switch. Paraffin is often seen as unsafe and a fire hazard; it is also seen as a "dirty" fuel which leaves prepared food with bad taste. If a household has had the experience of kerosene at an earlier stage, it can often prompt the same household to switch to another, higher on the energy ladder. However, the mitigating factor with kerosene is the ability to purchase it in small quantities, which is the major factor in explaining why people do use kerosene.

4.4.7 Distance to markets and energy use

Respondent 1 indicates that:

Rural towns and villages are particularly prone to a lack of modern energy services because of the high cost of connecting to energy infrastructures (e.g., electricity grid) and service networks (e.g., kerosene and LPG supply chains). Even when remote regions are supplied with modern fuels, services to sustain energy infrastructure are often in short supply, making the availability of energy unreliable.

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Respondent 2 reveals that:

Even high-income households in remote areas are frequently forced to rely largely on biomass because the low density of demand for modern energy services makes the supply networks prohibitively costly.

Respondent 3 shows that:

The trend of continued reliance on biomass fuels can be seen in Mutale Local Municipality, where the top expenditure docile in rural areas uses almost seven times as much of biomass energy as the top expenditure docile in urban areas. Though the energy ladder model has been used to understand the energy use dynamics of urban households in developing countries, the model provides a limited view of reality in actual households.

It is specifically limited in its ability to estimate the actual quantities of different fuels consumed by households.

4.5 Conclusion

This chapter dealt with data analysis and interpretation. 50 respondents, who included community members completed questionnaires related to the challenges faced by Mutale Local municipality with regard to electricity supply, and the results of the service delivery rendered in the Mutale Local Municipality.

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CHAPTER 5: FINDINGS, RECOMMENDATIONS AND CONCLUSION

5.1. Introduction

This chapter presents the discussion and conclusion following the findings in the previous chapter (chapter 4). In this chapter the researcher begins with a general overview of the institutional capacity of electricity supply services for rural communities in Mutale Local Municipality of Limpopo province, which shows that the aims were achieved. The experiences of stakeholder and government officials obtained from questionnaires conducted are described together with the recommendations for improving electricity supply systems in Mutale Local Municipality. This chapter contains some concluding remarks about the contribution of this study to stakeholders in general. As a result households are willing to pay for improved electricity supply and services

5.2 Major Findings

The study has found that the level of education has an impact on the development of a particular area. Mostly an uneducated person tends to have less care on what is being done to develop the area. It was found that most of the electricity cables which been destroyed, is due to carelessness particularly by people with limited education and inability to value the grid electricity supply.

It was discovered that households have an income in the range of R100-R2000; this indicates a high degree of income inequity where few people have higher income while many receive low income. In most families, one person contributes towards the demands of the big family using a lower salary. Due to the lower salary, the family is encouraged to follow the proper in energy grid electricity supply practices. Lack of sufficient money leads people to choose unimproved facilities such as solar, paraffin, gas, candle and firewood as their only source of energy for households chores.

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It is clearly indicated that to transform this community from candle usage is necessary. Candles are the most dominant energy source used for lighting, and these candles have some negative impacts on human lives. The increasing cost of paraffin has contribution in the manner in which the society chooses their energy source since they cannot afford to buy it on a daily basis.

Majority of the in the village travel more than 2km in search for energy. This is a good indication that people have completely over utilized their surrounding woodlands patches and as such they have to travel longer distance to areas where firewood is available. The majority of people are unemployed; they cannot afford to pay for the transportation of their firewood.

It was found that the municipality does not have enough funds to render electricity to the communities. The backlog regarding electricity supply in rural communities needs a lot of money to address. The demand by the townships and urban residents put more constraints to the municipality to an extent that funds become insufficient to fulfill its obligations.

With regard to the aim and objectives of the study that were stated in chapter one, the causes and impacts of firewood scarcity on livelihood and on the environment were identified and examined. The impacts of firewood scarcity on rural livelihoods were evaluated. The study indicated that women were at the forefront both in the collection and utilization of firewood. From the analysis it was also clearly indicated that firewood was the most commonly used source of energy in the village and it was used for domestic activities such as cooking and heating of water.

It was also indicated that the majority of people collected firewood twice a week; this was due to the fact that most of the people are working during the course of the week and those who do not have any form of employment could go three times or more depending on the availability of the firewood in the forest. The study also found out that there were no deliberate conservation measures on the management of firewood however the majority of the respondents had indicated that they extinguish their fire immediately after cooking. There is a need for both the government and

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private sectors to intervene and develop some strategies which will promote both conservation and sustainable utilization of the woodland resources.

When the community was asked on what do they think that these woodlands can be used for other than current activities, this community was of the view that it would be much better if the land can be converted into a community park or any other sort of recreational activity in which they can generate income and that can also help in job creation particularly for the youth and women who are still marginalized in the society.

5.3 Recommendation

The Municipality must improve on the management and provision of electricity. The municipal officers must ensure that the electricity vending machines are at all times functional. The maintenance of the machines may be contracted to service providers whose service level agreement will determine their ability and continued contract. The shortage of electrical power points and their accessibility must be addressed through the acquisition of more of them and further ensure that they are located within a walking distance. The damage that is caused to electrical appliances owing to electricity cuts must be avoided to prevent losses to the community.

Ward committees that are representative of all the community members, regardless of political affiliation, should be established as guided by the relevant legislation. This is intended to ensure that the community is afforded an opportunity to raise matters affecting them with their leaders who, in turn, must ensure that the municipality receives the issues as tabled. Ward Committees will therefore serve as the communication channel between the municipality and the community. The councillors as part of their responsibility to serve the community must as part of their performance undertake to convene such meetings and encourage all community members to freely and openly raise issues in the interests of building and encouraging community participation. The councillors must be held responsible and be taken to task if they fail to convene such meetings. The code of conduct must be evoked in the interest of ensuring that they execute their responsibilities.

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Communities should be involved at implementation and decision making levels and in the implementation of projects. Projects are supposed to be part of the IDPs of each municipality. They are intended to achieve the objectives of services available and concomitantly provide the much needed jobs. The Ward committees of municipality must be vigilant in ensuring that projects benefit the communities in which they are located. Communities should benefit directly from programmes in matters such as employment and training. Certain projects can also be coordinated by ward committees to ensure better mechanisms of completion and progress of projects. Moreover, ward committees have to be trained and their involvement will minimise the mistrust prevalent in the community.

The environmental management issues raised need to be taken seriously into consideration. The provision of toilet facilities must be such that underground water is not polluted. Noting the extend of the under spending of allocations of infrastructure development like sanitation, the municipality must involve direct beneficiaries as a form of their contribution and utilise the services of local builders in building acceptable ablution facilities. The waste removal, disposal and general waste management must keep with the prescriptive legislation on this matter. Members of the public must be encouraged to formally lodge complains in respect to the manner in which the municipality manages its waste. This should be done through public awareness programmes and activities. This will ensure that the health risks facing the community are drastically reduced and healthy living conditions are created.

Infrastructure provisioning, management and maintenance need serious attention. The municipality must ensure that knowledgeable people are assigned to supervise or monitor the development of infrastructure like roads. This will ensure that value for money is attained. Contract management aspects of the municipality must be reinforced and applicable standard measures be observed. The provisioning of houses must be done in accordance with the stipulated requirements and further ensure that the intended beneficiaries are benefiting. The municipality must also ensure that there is provisioning of recreational facilities. This will serve better to afford the youth venues for leisure and recreation and assist in the reduction of crime and indulgence in alcohol and drugs.

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The municipality must put better systems into place to ensure effective and efficient spending. The under-spending currently experienced is due to lack of proper planning, management and co-ordination of activities and projects. The community lacks a great deal of infrastructure development yet funds are not spent, which is perceived in a serious manner by the community. To correct the history of under-spending, finances must be controlled for local government development activities. The introduction of Medium Term Expenditure Framework (MTEF) to address the challenges of under-spending will improve financial management.

It is of great importance that social and economic aspects of fuelwood use are understood and researchers, decision makers, foresters, conservationist, energy specialist and other role players need to understand and know the type of wood being used, how they are used, household economy and environmental impacts. All these factors play a very significant role in the utilization of fuelwood.

Gender differences need to be taken into account when implementing fuelwood related projects. Fuelwood users and managers must be consulted and given a hearing simply because they have local knowledge regarding the use of firewood.

Since the community could not be completely separated from their traditional utilization of natural resources, renewal should be applied where applicable as an alternative to provide a chance for the biodiversity to regenerate and recover.

The municipality, community members and headmen in the study site should consider participatory decision making on the management of woodlands and related activities. This would avoid conflict associated with harvesting of firewood and ownership.

The national, provincial and local government should hire expertise to monitor the woodlands or biodiversity as a whole in the rural area because its loss is leading to an increased crisis of habitat fragmentation which leads to a huge loss of the biodiversity.

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5.4 Conclusion

Electricity is an essential resource for human economic and social development. As a social economic good the provision of such services needs to go together with policies and legislation that provide a clear direction for implementing sustainable pro-poor policies. People have the right to access and benefit from safe and affordable electricity that enables them to meet their energy needs. Nevertheless electricity is an economic resource. It has a value. The users need to compensate a certain percentage of the value to sustain the provision of quality services. When transparency and accountability are overlooked, inefficiencies such as leakages and unclear pricing against metering occur.

From the results of the study, it appears that people are happy that they are connected to grid electricity, but are not satisfied with the services that they are getting from Eskom and the municipality. This contradicts with the government's emphasis on quality service provision especially to the poor. Eventually people are tempted to neglect the requirements and start abusing the systems. Awareness is the key component in the domestic electricity provision. Much as we are saying the users have the right to access quality services, they have a role to play to ensure meaningful quality services. For this they need sufficient information about the various aspects of domestic electricity provision, such as how the different metering systems work, what FBE means for them and how energy savings (thus costs savings) can be achieved.

It was proven beyond reasonable doubt in this study that firewood, (and women as the principal collectors), is the most used woodlands resources for present and future energy use. The study also found that irrespective of the current electrification taking place in the area, firewood remains the primary source of energy in the village and for that reason woodland remains the key resource for rural people livelihoods. Therefore the societies will continue to use firewood for domestic activities such as cooking and heating water.

In the process the study did not find strong evidence of deliberate energy conserving practices such as using other sources of energy for cooking, while firewood was

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extinguished after cooking in many of the households in the village. However the study also concluded that firewood is the most widely used woodland resource in the village.

The study also found that the majority of people in the society did not know of any government programme of action set for conservation and sustainable management of woodlands in their area. The conversion of these woodlands patches to a community park was highly recommended by the community members.

5.5 Further Recommendations of the Study

- The municipality must put better systems into place to ensure effective and efficient spending. The under-spending currently experienced is due to lack of proper planning, management and co-ordination of activities and projects. The community lacks a great deal of infrastructure development yet funds are not spent, which is perceived in a serious manner by the community.

- The environmental management issues raised need to be taken seriously into consideration. The provision of toilet facilities must be such that underground water is not polluted. Noting the extend of the under spending of allocations of infrastructure development like sanitation, the municipality must involve direct beneficiaries as a form of their contribution and utilise the services of local builders in building acceptable ablution facilities. The waste removal, disposal and general waste management must be in keeping with the prescriptive legislation on this matter
- The control and regulation of the electricity distribution system in the community;
- Promotion of efficient and compassionate delivery of basic health care systems in the community.

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APPENDIX A : QUESTIONNAIRES

Please make a tick in the appropriate block for each of the following statement

Biographical information of the respondents

Table 4.1: gender status of the respondents

Male	
Female	

Table 4.2: Language used by the respondents

English	
Tshivenda	
Tsonga	

Table 4.3: Employment status of the respondents

Full time	
Part time	
Unemployed	
Pensioner	

Table 4.4: Educational information of the respondents

Below matric	
Matric	
Diploma	
Degree	

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SECTION B:

Please complete all questions Mark with an "x" Mark from Strongly Agree to Strongly Disagree

Statement	Strongly agree	agree	uncertain	disagree	Strongly disagree
There is a poor distribution of electricity by ESKOM in Mutale Municipality					
Poor distribution of electricity causes illegal electricity connection					
Low income generation causes poor distribution of electricity					
There is a back log of electricity supply in Mutale Municipality					
The Mutale Municipality is totally failing to provide electricity to its citizens					
Electricity cut-offs is prevalent in Mutale Municipality					
There is inadequate maintenance of electricity.					
There is negligence on the part of responsible ESKOM personnel					
Maintenance procedure and remedial actions were adequate					
Community use gas as a					

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source for the domestic purposes					
People use paraffin for cooking.					
People use firewood for cooking					
Electricity supply is a problem in the village.					
Other people do have electricity while others don't.					
Electricity is an issue in this village.					
Solar energy is another source of energy.					
Financial constrain is another serious problem to those who have electricity					
Poor maintenance of electricity supply system causes shortage of electricity.					
Wood collection is another form of saving electricity					

Thank you for your Contribution

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SECTION C: OPEN ENDED INTERVIEW QUESTIONS

What are the fuel switching and the energy ladder Mutale Local Municipality?

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What is the Distance to markets and energy use?

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What is the Non- grid electrification programme?

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What is the type of re-use of deinstalled solar home systems?

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.....

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What are the household energy trends in Mutale Local Municipality?

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