UNIVERSITY OF KWAZULU-NATAL

AN EXPLORATORY STUDY OF FACTORS DELAYING THE COMPLETION OF ELECTRIFICATION PROJECTS IN KWAZULU-NATAL OPERATING UNIT (KZN-OU)

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DEDICATION

I would like to dedicate this dissertation to God and my wonderful family.

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Gratitude to God Almighty for His sufficient grace to finish this dissertation successfully.

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ABSTRACT

Electrification of a community is usually a big project for the good welfare of the citizens and economic development in South Africa. Most of the electrification projects undertaken in recent years in South Africa are delayed well beyond the expected time for completion and also required additional budget. The delays have substantial implications from an economic and political point of view. Delays of projects could be minimized only when their causes are identified and recognized. The aim of this qualitative study is to explore the challenges faced by projects managers and coordinators in completing electrification projects at Eskom electrification department and to ascertain the strategies which may be adopted to reduce delays in completion of electrification projects at Eskom electrification department KwaZulu-Natal-operating unit

The study used a qualitative research methodology. Using a non-probability samling technigue, ten project managers and coordinators were purposively selected and interviewed to get their view of factors contributing to the delays in the completion of electrification projects in KwaZulu-Natal. Data were analysed using thematic analysis.

The findings indicated five strategies that could be adopted by Eskom to reduce delays in rural electrification. These include: clear separation of tasks and activities into phases, setting realistic targets, working together/teamwork, integration of departmental goals, and proper alignment of Eskom processes and adequacy of resources. Furthermore, it was recommended that Eskom should prioritize projects according to size, cost and importance; there should be a fair allocation of work to avoid overloading of contractors; a well-planned strategy which emphasizes on the accuracy of estimation of project cost and adequate resources; and penalty to incompetent contractors.

Key words: Project management, project manager, project coordinator, electrification projects, delays to project completion

CHAPTER ONE: INTRODUCTION

1.1 Introduction

The aim of this chapter is to provide an introductory view of the entire study by providing the context of the study, the research objective, but also nature of the research problem, which is core to this study. The chapter also unpacks the key research question in this study and methodology employed to understand the research question. Electricity projects in most communities are enormous utility projects, which bring about rapid and sustained infrastructural development. Electricity projects are developmental in nature and usually consume a huge amount of money (Grogan and Sadanand, 2013). These projects may be out-sourced to contractors and consultants for proper execution. However, successful completion of electricity projects in a particular region helps to improve the quality of life of the people. Delays in the completion of electrification projects are one of the recurring problems in some societies today. Delays have costly and unpalatable consequences on project success in terms of time, cost, quality and safety of the people. These consequences are not only restricted to the electricity industry but they also influence the overall economy of a country. According to the World Bank (2008), there are so many benefits being derived from electrification that contribute to improving the quality of life in most societies. However, apart from lighting which improves the study environment for school children, electricity also improves businesses, thereby providing employment opportunities, hence contributing to poverty reduction (Grogan and Sadanand, 2013). Access to electricity also allows access to information and entertainment by making it possible for people to own televisions. More so, the delays in completion of electrification projects faced in most communities are mainly due to the inadequate provision of funds to the contractors at the right time (World Bank, 2008) (Mawhood and Gross, 2014). This also compounds the problems encountered by the contractors to adequately pay their workers market-related salaries, grow their operations or purchase the latest machinery (Mawhood and Gross, 2014).

Eskom is the only major electricity utility in South Africa that supplies electricity for industrial, commercial, and domestic use. This positions Eskom as one of the building blocks and foundations of the South African economy (Eskom, 2016: 3). Few would deny the importance of electricity as an essential input to production and to economic activity in general (Cameron and Rossouw, 2012: 2). Therefore, timely delivery of projects within Eskom is of paramount importance in ensuring the utility continuously delivers on its mandate. However, South

Africans are currently being subjected to load shedding which comes as a result of limited generating capacity and an ever-increasing demand for electricity. The lack of electricity supply and interruption of supply is increasingly recognised as a potentially serious constraint on sustained economic growth, given the wide consensus on the important links between electricity and economic development (Adugna, 2015).

Among the electrification projects undertaken in recent years, most are delayed well beyond the expected time for completion and also required additional budget more than contracted during the commencement of the respective projects (Durban CBD Office Market Report, 2012) (Adugna, 2015). This problem, in turn, is causing difficulties in the financing of upcoming projects, timely utilization of the facility by the public and the relationship among stakeholders (Employer, Manager, project coordinators, Financier, etc.) involved in the project process (Durban CBD Office Market Report, 2012). (Adugna, 2015). Delays have substantial implications from an economic and political point of view. Therefore, the aim of this research is to explore the factors that cause delays in electrical projects at Eskom, KwaZulu-Natal province.

1.2 Background on Research Locality

Eskom is a state-owned utility responsible for generation, transmission and distribution of electrical power that generates approximately 95% of the electricity used in South Africa and approximately 45% of the electricity used in Africa. Eskom generates, transmits and distributes electricity to industrial, mining, commercial, agricultural and residential customers and redistributors. Eskom strives to fulfil its mandate in terms of providing efficient, effective and sustainable operation of electricity supply infrastructure, promoting the use of renewable energy sources and energy efficiency as well as to facilitate universal access to electricity for South African consumers (Gazette, 2006). The way rural electrification project is executed is key in South Africa as it affects most those who were previously disadvantaged. The study focuses on KwaZulu-Natal which is a province in South Africa.

1.3 Problem Statement

Electrification of a community is usually a big project financed mostly by the national government, Department of Energy (DoE) for good welfare of the citizens and economic development (Africa national energy policy 2012). It is important that electrification projects are often out-sourced to contractors for proper execution (Africa national energy policy 2012). Timely completion of electrification is key not only in Africa. Globally, 1,456 billion people have no access to electricity of which 83% are in rural areas. This is no exception in Africa where the majority of people in rural areas have no access to electricity and rely heavily on wood for cooking, which has adverse effects related to indoor pollution and health complications (Africa national energy policy, 2012). In Sub Saharan Africa, 12% of the rural population have electricity which is far less than the 35.4% average access to developing countries worldwide (Africa national energy policy, 2012).

In some developing countries, subsidisation policies vary according to governments objectives. For example, in the case of South Africa, the National Electrification Project aims to meet the needs of households, institutions of learning and health centers, based on the impact analysis of the electrification project in various sectors of the areas (Dinkelman, 2011). In Uganda, the electrification project is carried out through the utility private providers who are faced with an insufficient supply of generation that is not equal to demand. As a result of market failures, electricity connection is high and private distribution companies are forced to load-shed by selectively cutting off power to some consumers, leading to an unreliable power supply in some areas (Ezor, 2012). Nonetheless, there have been other cases where subsidies have disproportionally been allocated, such as Malawi, where the urban households have been subsidized at US$ 300 compared to rural households getting US$ 60 (Gustavsson and Ellegard, 2005). Likewise, some communities in Ethiopia, affordability is a key obstacle to the ability to obtain reliable modern energy in most living areas (Rogers, Sovacool and Clarke, 2013). As a result, such communities are heavily dependent on the continued use of traditional fuel sources like kerosene, firewood, charcoal and farm residues, for their lighting, cooking and heating. Rural households in Ethiopia not only have limited access to modern energy sources but also incur high expenditures on traditional fuel sources (Abdullah and Markandya, 2012).

In the apartheid era, energy for the black South Africans was not regarded as an energy policy issue. Electricity service provision for black South Africans formed a highly charged policy arena (Andrew et al., 2007). The lack of access to energy and more precisely to electricity is

one of the major impediments to economic development. The high connection costs coupled with low consumption of electricity and low incomes among various households are obstacles to the electrification of rural areas. In the post-apartheid era, rural electrification is one of the critical aspects of what Eskom is focusing on in South Africa.

The problem of delays in the completion of electrification projects in South Africa is central to this research. Electrification projects in some African societies are usually delayed as a result of many challenges such as poor funding, bad leadership, political instability, corruption, global crisis, etc (World Bank, 2008). More so, poor funding on the part of the South African government and high connection costs are parts of the things that cause delays in the completion of electrification projects; most especially among the rural dwellers and households. There are areas that are more connected with electricity than others. Some areas are faced with political interference leading to stalled electricity projects. Given the fact that electricity is key for communities, this study examines the delays in completion of electrification projects in KwaZulu-Natal operating unit (KZN-OU).

1.4 Objectives of the Study

The objectives are as follows:

1.4.1 To explore the challenges faced by projects managers and coordinators in completing electrification projects at Eskom electrification department of KwaZulu-Natal Operating Unit

1.4.2 To ascertain the strategies which may be adopted to reduce delays in completion of electrification projects at Eskom electrification department of KwaZulu-Natal Operating Unit

1.4.3 To make recommendations on how Eskom electrification department may complete projects on schedule and according to plan in KwaZulu-Natal Operating Unit

1.5 Research Questions

The study aims to answer the following questions:

1.5.1 At the level of project managers/coordinators, what challenges are faced which delays project completion at Eskom electrification department KZN-OU?

1.5.2 What strategies could be adopted by Eskom electrification department KZN-OU to reduce delays in project completion?

1.5.3 What can be recommended to Eskom electrification department KZN-OU to complete projects on schedule and plan?

1.6 Scope of the Study

The study targets employees in electrification department at Eskom KwaZulu-Natal operating unit. In total there are 63 employees in electrification department. A sample of 10 employees comprising of project managers and project coordinators was purposely selected out of the total population to get their in-depth understanding of delays in the completion of rural electrification projects in KwaZulu-Natal. Eskom is situated in nine provinces and KwaZulu-Natal operating unit is one of them. KwaZulu-Natal was chosen as the context of the study primarily for convenience and pragmatic reasons in terms of cost and time to book and travel for interviews. As a result of this limitation, the findings generated in this study cannot be used generalized, but rather transferred to other similar contexts. The major reason why this study is focused on project managers and project coordinators in electrification department is that several studies have been undertaken previously but focused on other employees, suppliers, contractors and various departments at Eskom. This study is distinct as it focuses on project managers and coordinators who have lived experiences of various electrification projects at Eskom in KwaZulu-Natal operating unit.

1.7 Significance of the Study

The study is significant in providing insights to management of Eskom and municipalities on key challenges which contribute to recurrent delays in the completion of rural electrification projects. The recurrent challenges need a concerted effort by management at Eskom in order to enhance the successful completion of future electrification projects. The successful completion of electrification projects can make an important contribution to development that can enhance the quality of life and education of the people staying in KwaZulu-Natal province. Furthermore, the research findings will contribute to the existing body of knowledge and also stimulate further research on the topic. The existing literature on electrification projects is mainly focussed on rural electrification and the benefits of rural electrification. There is a gap in the literature examining factors delaying completion of electrification projects, therefore, the findings will add more to literature in this regard.

In addition, this research study will be of immense and great benefit to the implementers of electrification projects as well as other interested stakeholders in the electricity and energy industry. The Ministry of Energy can use the findings to promote timely completion of electrification programmes (REP) projects in both the rural and urban areas of South Africa. This can be achieved by acting on the proposed recommendations of this study. To the educationists and researchers, the findings of this study will also be of great importance as a basis for further learning and research. This is because the study will provide the background information to research organizations and scholars who may want to carry out further researches on rural electrification and its challenges relate to project completion.

1.8 Structure of the Study

This study comprises five chapters which are outlined below.

1.8.1 Chapter One: Introduction

This chapter provides an insight on the nature and significance of the study, a brief insight into delays of electrification projects, its objectives, key questions to be asked and an elaboration on the structure of the study, its scope and significance.

1.8.2 Chapter Two: Literature Review

This chapter will review literature on electrification and project delays in electrification projects. It will provide an overview of electrification projects worldwide and more specifically on electrification projects in South Africa, challenges facing electrification and provide statistical analysis of electrification in Africa and South Africa. Thereafter, it will focus on delays factors of electrification projects, types of delays, delay factors in electrification projects and the impacts of delays on project completion. Finally, it will discuss the strategies for improving electrification projects and relate the agency theory to why projects get delayed.

1.8.3 Chapter Three: Methodology

This chapter will provide a research procedure that will be adopted to undertake this study. It will elaborate on the research design that will be used with an explanation on the rationale for the choice of the research design. This will be followed by discussions on the target population, the sampling techniques, sampling procedures, pilot study, the instruments for data collection,

how data will be analyzed and presented, validity and reliability of the study and finally ethical considerations in the study. The chapter indicates how data was analysed in this study. Data were analyzed using thematic analysis by identifying common themes form narratives by respondents.

1.8.4. Chapter Four: Results and discussion

Findings are presented in details and discussed in this chapter. This chapter also discusses the key results in relation to previous studies and relevant literature

1.8.5 Chapter Five: Conclusion and recommendation

This chapter presents the conclusion and recommendations of this study. Limitations of the study and future areas of research will also be discussed in this chapter.

1.9 Summary

This chapter has provided a brief background of electrification projects and factors which cause delays in various countries. The chapter has also provided an insight into the nature of the research problem, key research objectives and significance of the study. The outline of the chapters which make up this thesis is provided. With this in mind, the next chapter focuses on literature relevant to this study.

CHAPTER TWO
LITERATURE REVIEW

2.1 Introduction

Sarantakos (2005:137) defines a literature review as "a study of the research object with the aim of collecting information about its structure, process and relationships, thus increasing the familiarity of the researcher with the research object and strengthening the credibility of the project". It considers previous research to show relationships between the current study, it also looks at how other researcher's approach to similar topics to the current study which enables the researcher review theories that can be most suitable for the present study (Sarantakos, 2005). This chapter reviews literature on electrification projects, causes of delays in electrification projects, impacts of delays on projects and some preventive measures that could be taken to reduce delays in electrification projects. It commences with an overview of electrification projects globally and specifically in South Africa; followed by analyzing the challenges faced by the South African society with regards to electrification projects. Thereafter, it focusses on the types of delays, factors that cause delays in electrification projects, impacts of the delays on project completion and provides some strategies that could be used for improving electrification projects in South Africa and to the rest of the world.

2.2 Electrification of Project in Africa

Electrification is the act of making sure electricity services are provided to a specified community at a point in time (Tenenbaum, Greacen, Siyambalapitiya and Knuckles, 2014). However, the electricity industry is made up of a complex system where different factors interact to influence the demands of the different consumers. Key among these factors is the institutions for the delivery of electrification project and the provision of reliable services particularly to household customers, which probably exert the greatest effect on this industry (Tenenbaum et al., 2014). Country governments also play a major role as they are responsible for establishing policy in the form of new laws and regulations that promote, accelerate or improve electrification project amongst their citizens. Globally, 1,456 billion people have no access to electricity of which 83% are in rural areas (Africa national energy policy 2012). The region most affected by the lack of electrification is Africa, specifically Sub-Saharan Africa. While the electrification rate in North Africa reached 99% in 2011, it was not higher than 32%

in sub-Saharan countries (Africa national energy policy 2012). These figures are even more alarming when we consider the electrification rates in rural areas. The International Energy Agency (IEA) reports that only 65.1 percent of rural areas in developing countries had access to electricity in 2011, while rural electrification rates of transition economies and OECD countries was 99.7 percent. Electricity alone may not be able to create all the conditions for economic growth, but it is obviously essential for basic human needs and economic activity (IEA, 2013). In theory, access to electricity can improve socio-economic conditions in developing countries through its influence on key components of poverty, namely health, education, income and environment (Kanagawa and Nakata, 2008). Concerning rural areas, Khandker, Barnes, and Samad (2009) claim that lack of access to energy and more precisely to electricity is one of the major impediments to economic development. Chaurey, Ranganathan and Mohanty (2004) argue that a strong correlation exists between rural poverty and access to electricity because electricity is a pre-requisite for productive activities. In addition to improving productivity by giving access to more efficient means of production, access to an electrical grid and better electricity services could also lead to household time savings and allow them to work more hours by increasing their access to markets (Bernard and Torero, 2011).

Africa's efforts towards electrification projects are stipulated in the Government's Sessional Paper Number 4 on Energy (May, 2004). This is the paper that laid the foundation for the formation of the Rural Electrification Authority (REA), which was charged with the responsibility of accelerating the pace of rural electrification in the country and ensure that affordable, cost-effective and adequate quality energy sources are made available on a sustainable basis. Rural Electrification Authority was established in 2007 under Section 66 of the Energy Act of 2006 in Kenya with the principal mandate of extending electricity supply to rural areas, managing the rural electrification fund, mobilizing resources for rural electrification and promoting the development and use of renewable energy (MoE, 2013). In some countries in Africa, rural electrification projects are mainly undertaken by the REA, though some works are carried out by Africa Power & Lighting Company (KPLC), which also connects customers and operates and maintains the national grid. The objective of the electrification project, which is financed by the government, is to provide electricity in areas that are far from the national grid, and where electricity supply projects are not commercially viable, with a view to improving the social and economic lives of Africans in those areas.

In 2010/2011, the government of Kenya, through KPLC and REA implemented a total of 1,033 projects spread across constituencies, projects which benefitted 734 market centres, 535 public schools, 34 polytechnics, 177 health centres, 44 government centres, 31 coffee factories, 75 tea-buying centres and 127 water projects among others (Mwihaki, 2015). However, despite all these efforts, electricity access and connectivity rates still remain low in Africa. One reason for this low level of electrification in some areas is the lack of finance to cover capital and operating costs for generation, transmission and distribution of electricity, which are all higher than in urban areas (Mwihaki, 2015).

A study by Sabah Abdullah and Anil Markandya, (2007) on rural electrification programmes (REP) in Africa indicates that the program has faced setbacks due to high connection costs. The willingness to pay to be connected to the grid and photovoltaic services is less due to the high cost which the government needs to deal with through reforming the energy sector by giving subsidies. The Africa overall electrification rate in rural areas is 14% which is far below the sub-Saharan Africa level of 23 % (Abdullah and Markandya, 2012). Lack of enough capital in rural areas has led to poor electrification as the cost increases with distance from the grid, which makes connection cost in urban areas cheaper than in rural areas. The low consumption of electricity in rural areas and low income makes an extension of the grid to those areas uneconomical. In Africa wood fuel provides up to 70% of the energy sector except for transport and commercial purposes. This has led to high indoor air pollution (Abdullah and Markandya, 2012).

Other challenges facing the energy sector in Africa is quantity, quality and reliability of energy supply, high initial capital outlay, and long lead times from feasibility studies to development of energy infrastructure, mobilizing adequate financial resources to undertake investment in the power sector and high cost of energy, low per capita incomes and the low level of industrialization (Africa national energy policy 2012). Challenges of institutional arrangements; governance issues, lack of research institutes, funding constraints and inadequate human resources capacity and overlap of the mandate of various institutions (Africa national energy policy 2012). Moreover, the high connection costs coupled with low consumption of electricity and low incomes among various households are additional obstacles to electrification. As such, over 70% of Africa's total energy consumption is derived from wood-based sources and more than 93% of households depend on this source (Ministry of Environment and Natural Resource (MENR), 2005). This has environmental implications that

render it unsustainable. Power supply disruptions caused by the transformer vandalism have become very difficult to predict hence difficult to control (Brian, 2013). A lot of resources have been put in place in engaging security services leading to a lot of arrests, but the syndicates appear difficult to dismantle due to weak legislation and the law enforcers have no capacity or knowledge to understand the socio-economical implication of theft and vandalism.

The supply side of electricity comprises of the institutions for the delivery of electricity services, largely the Rural Electrification Authority and the Africa Power and Lighting Company. The market for electricity services comprises of a complex system that consists of economic, technical, financial, institutional, social, environmental and political factors that influence the demands of the different consumers (Barnes, Khandker and Samad, 2011). Amongst all these factors, the institutions for the delivery of electricity services and the provision of finance to customers greatly affect these markets. When a government policy seeks to promote access to renewable energy sources, it needs to influence factors such as: affordability, disposable income, availability and high quality of modern sources (Barnes et al., 2011). In the case of the residential sector, affordability is particularly considered to be one of the main obstacles to the adoption of modern energy.

There have been a number of different policy programmes initiated by the Kenyan government together with other key institutions like the Africa Power & Lighting Company (KPLC), to increase electricity services across the country. One of the key areas has been the rural electrification programme (REP) established in the early 1970s. The REP funds are obtained from a 5% levy, namely the rural electrification programme levy fund (REPLF), which is charged to all electricity users nationwide (Mwihaki, 2015). The REPLF is one of seven decentralized operational funds in Africa aimed at alleviating socio-economic disparities at the local level. Another initiative promoting electricity access in the rural areas is "*Umeme Pamoja*", which translates as "Electricity Together" (Mwihaki, 2015). This campaign seeks to establish a joint group of households, so as to connect them collectively to the grid, thus saving costs. This scheme is financed by the group settlement electrification schemes created by the KPLC. According to them, this scheme is aimed at making electricity connection easier, affordable and faster (KPLC, 2006).

The REP cost in Africa has been estimated to be between US$ 25 to US$ 40 per kWh, compared with an amortized lifecycle cost of US$ 1 to US$ 2 per kWh for solar and battery operated systems (Kembo, 2014). The World Bank (1995) report argues that only 10% to 40% of the

economic cost of REPs is recovered from the users; meaning the programmes need to be heavily subsidised by the government. About 60% of the REPLF finances new grid-extensions, with the rest being spent on operation and maintenance (Kembo, 2014). Furthermore, Africa's REP has been handicapped by financial burdens (Africa Integrated Household Budget Survey (KIHBS, 2007). The greatest challenge for the energy market in Africa is the sustainable balance between investment and supply. Indeed, investment through greater involvement of new providers including the private sector remains an arduous task (Kembo, 2014).

2.3 Electrification Projects in South Africa

The watershed event, which provided the impetus for all the policy and institutional shifts underpinning the electrification programme, was the demise of apartheid and the election of a post-apartheid government in 1994. Apartheid policies left two key legacies: first, a history of racially determined differentiation in infrastructure provision, and second, a stark contrast between rich and poor, which was largely racially defined (Andrew et al., 2007). The UNDP's Human Development Index (HDI) for South Africa in 1988 indicated that South Africa had a considerably lower HDI than similar-income countries. The index disaggregated for race indicated that while white South Africans ranked above average by comparison to industrialised countries, black South Africans ranked with low-income developing countries (Stats SA 2000:101). The poorest 20% of the South African population between 1987-1994 ranked 33% lower than the developing country average and markedly lower than the same segment in middle-income developing countries with similar average incomes to South Africa (Stats SA 2000:103). This significant disparity in income was matched by disparities in access to basic services and infrastructure. The first census in South Africa which surveyed the whole population in 1996 census indicated only 58% of the country's population lived in formal housing. Only 58% of the population had access to electricity, and only one in four non-urban black South African households was electrified, as opposed to 97% of non-urban white households (Stats SA 2000:90). At the beginning of the electrification programme, the situation was much worse; by comparison to countries with similar income levels like Argentina (88%), Venezuela (86%), Costa Rica (85%), Thailand (75%), and Brazil (65%). The estimated proportion of households with access to electricity 1990 in South Africa was a very low 35% (Eberhard and Van Horen 1995:48).

In 1990 South Africa possessed an extremely energy-intensive economy, and a world-class electricity supply industry in the form of the state utility Eskom (Bekker, Eberhard, Gaunt and Marquard, 2008). Thus, the electricity sector faced a few of the usual barriers to electrification in developing countries: lack of access to capital, lack of skills and lack of supply infrastructure. In addition, much of the initial demand was for urban electrification, devoid of the challenges encountered in rural electrification projects. The main barriers to widened access to electricity in the late 1980s were institutional and political, both were swept away by the democratic transition in the early 1990s, which provided not only a fundamental shift in the political landscape but also an unusual institutional environment for policymaking (Andrew et al., 2007). During the initial negotiation process, much policymaking moved from the state to stakeholder forums. This was an uneven process since the entry into the policy process of anti-apartheid political grouping also changed the content and scope of the policy agenda significantly (Andrew et al., 2007).

2.4 Challenges of Electrification Projects

When looking at global data for electrification trends, we see that over the past 20 years, almost 1.3 billion people in developing countries have been supplied with electricity. Of these, 700 million lived in rural areas and 600 million in urban areas (Barnes, 2005). Over the same period, all regions increased the shares of households having access and nearly tripled the numbers of people served. The extraordinary achievement is magnified by the fact that the newly electrified dwellers represent twice the combined populations of the USA, Europe and Japan, testifying to the great efforts developing countries and their partners are making (Barnes, 2005). Overall, the progress in terms of electrification at the global level is driven by the progress of China and more recently of India, but a focus on less dynamic Asian countries and on sub-Saharan Africa as a whole denotes a less rosy picture with nearly half of the rural population of South Asia and more than 85 percent of the rural population of sub-Saharan Africa still without access to electricity (Barnes, 2005). The provision of electricity services and the improvement of their quality poses formidable challenges for many countries. While some of the problems are country-specific, many of them are common to a number of developing countries.

In the South African context, apartheid kept an interest in ensuring that energy poverty was off the policy agenda through the exclusion of most of the population. Interest in energy-poverty

problems in state agencies began to emerge in the 1980s but was marginalised in key decision-making structures (Andrew et al., 2007). Energy for the poor was not regarded as an energy policy issue, and service provision for black South Africans formed a highly charged policy arena dominated by the security establishment. In addition, within the state system, there was not even basic demographic data on most black communities until the 1990s. The struggle against apartheid was largely literally a struggle by candlelight (Andrew et al., 2007).

The first significant attempts to quantify energy use in low-income households were documented by Eberhard (1984, 1986). This work was influential in the work of Dingley **(**1987, 1990), who proposed the idea of a national electrification programme. The crisis faced by the apartheid state at the end of the 1980s, coupled with the dramatic political changes occurring with the beginning of the negotiation process, resulted in the rapid formulation of electrification as a definable problem at the beginning of the 1990s. Political attention was focused on apartheid-era institutional arrangements in the electricity sector, which had not been subject to policy scrutiny before. In the light of the transition they appeared unjust, inefficient and inadequate, and the lack of electrification appeared, to quote a former Eskom CEO, downright shocking. Lack of electrification in large parts of the country, explained in economic and other more esoteric terms, was now obviously almost entirely a direct outcome of apartheid (Andrew et al., 2007).

The electrification problem existed in two different frames. The first frame pioneered by the work of the Energy and Development Research Centre (EDRC) and by proxy the National Energy Council (NEC) and the Department of Minerals and Energy (DME) and other socially oriented policy analysts in the late 1980s and early 1990s.This was based on an analysis of low-income household energy use. Electrification was seen as one (and probably the most important) of a range of co-ordinated interventions to ameliorate energy poverty. Electrification policy was a subset of energy policy and should be integrated into a complete energy policy framework (Eberhard and Van Horen, 1995). The second frame, inherent in the approach of Eskom, local authorities and to a certain extent, the ANC's Restructuring and Development Programme (RDP), was based on the understanding of electrification as infrastructure development. In this way, electrification should thus be integrated with other service-oriented infrastructure development processes. This locates electrification institutionally in the same place as other forms of infrastructure development (Andrew et al., 2007). Some of the Challenges facing electrification are discussed extensively below.

2.4.1 Rurality and Electrification

One of the main challenges faced by countries in the process of electrifying rural areas is the remoteness of villages and their distance to power generating centres. Villages may be located at a considerable distance from the national or the regional electricity grids, they might be difficult to access (e.g. far from urban centres and with a difficult terrain with large rivers or jungles) or may suffer harsh climatic conditions often the same factors determining low population densities (Barnes, 2007). Rural communities are, by definition, dispersed with a low population density and frequently characterised by a low level of education and income (Niez, 2010). This results in low levels of household demand for electricity that generally is concentrated at evening peak times. The low population densities imply that electricity distribution costs must be spread over relatively few people, resulting in high expenses for each unit of electricity consumed (Niez, 2010). Demand normally matures slowly as consumers wire their houses, invest in appliances, and make the switch from other fuels to electricity. As demand grows, the cost per customer for rural electrification declines. Unfortunately, this progression is difficult to predict, making returns to investment in grid extension uncertain. Combined, these conditions imply that relatively large investments in capital are required for rural electrification, combined with poor financial returns in the short run (World Bank, 2006). Electrification programmes which have proved to be successful did not provide electricity uniformly to all rural areas. Among other factors, this has been due to investment costs, the number and size of local contributors, and the total number of potential consumers. For example, in Costa Rica, rural areas have been prioritized according to their population density, level of commercial development and expected electricity demand (Barnes, 2007). Similarly, in Thailand rural areas were ranked according to a variety of factors such as average household income, the number of existing commercial enterprises and the government's plans for investments in the specific area (Barnes, 2007).

2.4.2 Affordability and Credit

The electricity pricing policy represents another major issue especially because households involved in the process are not wealthy enough to afford connections and electricity at prices that would be necessary to guarantee full cost recovery and profitability of investment (Torres, 1993). High connection costs prevent most rural dwellers from electrifying their houses. When

rural households in the villages of Mizque and Aiquile, Bolivia, were given the opportunity to purchase electricity services, 75 percent of households refused the offer due to high connection costs (Torres, 1993). The Independent Evaluation Group report on the impact of rural electrification stated that in the Philippines 50 per cent of the households were connected within 3 years from the start of electrification thanks to a special line of credit that had been offered to interested households, and the total electrification rate reached 80 percent just after 20 years (Independent Evaluation Group, 1994). In Thailand and India, there are still households in electrified villages that are not connected, even though the connection has been available for more than 20 years because they cannot afford the connection fee (Independent Evaluation Group, 1994).

Some governments have tried to make energy services more accessible and affordable to rural consumers by subsidizing them, and each country should be able to develop its own cost-saving strategies. In Thailand, electricity-related materials were standardized and manufactured locally, reducing procurement and transportation costs (Khandker, Barnes and Samad, 2012). In Costa Rica, the Philippines and Bangladesh, the adoption of the single-phase distribution systems, already used in the US rural electrification programme, brought major savings compared to the three-phase system currently used widely in Africa and elsewhere (Khandker et al., 2012).

Lowering the cost of electricity provision may make electricity accessible to the poorer parts of a population, but if the process is not well directed it may prove unsustainable, and households that are larger consumers of electricity may end up benefitting more. For example, in Indonesia, subsidized kerosene for cooking and lighting is available to anyone, and richer households benefit from the bulk of the subsidy (Khandker et al., 2012). In China, government subsidies keep the prices of household coal extremely low and consequently, Chinese urban households spend a comparatively lower percentage of their incomes on energy than do the households in other countries (Khandker et al., 2012). Such general fuel subsidies have proven inadequate in benefiting the poor: the middle-class and comparatively wealthy households, who can afford to buy more energy than the poor, get a disproportionate share of the benefits. As a consequence, in addition to the economic inefficiency introduced by the subsidy, equity is not served (Khandker et al., 2012). Also, for rural electrification programmes, large subsidies have been ineffective in reaching the poor and in many programmes the poor face barriers of high connection costs or cumbersome application procedures (Khandker et al., 2012).

The affordability problem is often exacerbated by the lack of credit channels (Pellegrini and Tasciotti, 2013). For most people in developing countries, credit through formal channels is unavailable, except at very high rates. In some parts of Africa, for example, moneylenders charge interest rates of 100 percent or more and access to credit is further limited by legal, regulatory and institutional barriers (Pellegrini and Tasciotti, 2013). However, emerging innovations in credit delivery systems, such as the Grameen Bank in Bangladesh and similar programmes, offer some promising approaches to providing short-term credit in rural markets (Pellegrini and Tasciotti, 2013). Although these programmes have been directed mainly at non-energy uses, similar instruments could be used to finance energy investments such as appliances and products (Pellegrini and Tasciotti, 2013). A recent study on approximately 1500 households living in the cities of Ouagadougou and Bobo-Dioulasso, Burkina Faso, highlighted that 80 percent of them had difficulty in getting credit (Grimm, Hartwig and Lay, 2013) (Dutch Government, 2011). In rural Burkina Faso, another study on 1200 households in the province of Ke´ne´dougou, measured that 60 percent of the interviewed households did not contract any loan in the last three years (Grimm et al., 2013). Those having access to credit got loans from informal channels demonstrating that bank credit schemes, as well as credit offered by some associations, are mostly inaccessible to poor rural dwellers (Grimm et al., 2013). The same type of evidence comes through the analysis of the Rural Income Generating Activities database, which collects households data for developing and transition economies (Grimm et al., 2013).

However, some poverty-oriented strategies, although confined to rather small intervention areas, are already in place. The Global Village Energy Partnership together with the Rural Energy Foundation, a Dutch NGO working to accelerate market development for solar energy in sub-Saharan Africa, offer standardized solar home systems to rural households with a 12-month credit facility (Dasappa, 2011). Furthermore, micro-credit institutions have become active within the renewable energy sector recently, and some of them have experience with lending programmes particularly suited for women (e.g. Grameen Shakti; IREDA; ENSIGN and Women's Union in Vietnam and Uganda; and the PV project with Uganda Women's Bank) (Dasappa, 2011). This said, a large share of poor households still has to finance the purchase of energy technologies through a cash purchase. When the technology is proven and costs drop, systems may eventually become affordable for the poorest (Dasappa, 2011).

2.4.3 Cultural Barriers

Despite the fact that having electricity is an appealing prospect for rural households, electricity programmes might meet resistance in some households resulting in a lower rate of electricity penetration. Women's position, in particular, is bound to influence the desirability and use of electricity for households. Electricity theoretically lessens the everyday burden of cooking, cleaning, washing clothes, etc., and these chores are typically done by women, who are also often the ones who spend more time at home compared to men. In patriarchal societies, where men are in charge of taking money-spending decisions, electricity-related expenditures do not receive the priority they would get had women been more involved in the decision process. For example, in Namibia and Swaziland, as a result of economic and traditional circumstances, women-headed households constitute a large share of the population living in rural areas (Koskela and Uman, 2015). While woman-headed households are energy users as much as male-headed households are, there is limited involvement of these in planning and implementing most of the projects in the energy sector (Koskela and Uman, 2015; Tobich, 2008).

Women's exclusion from the planning process happens both at the village and at household levels. An example of the former comes from the village of Uroa in Zanzibar which is nonetheless considered a success story due to the high level of both male and female participation in the electrification process (Koskela and Uman, 2015; Winther, 2008). In the village, two important female institutions; the village mill and the kindergarten still remain unconnected to the electricity grid whereas the male institutions such as the mosques and the fish market are connected (Koskela and Uman, 2015; Winther, 2008). Turning to private consumption, almost all of the electric appliances owned by the rural electrified households interviewed in Uroa, incandescent lights, radios, fans, television sets, irons, freezers, fluorescent lights, fridges, water kettles, blenders and videos had been purchased by men and were owned by them. Indirectly, however, women contribute substantially to the purchase of such appliances since women's income constitutes a large share of men's (Koskela and Uman, 2015; Winther, 2008). Despite the women's positive evaluations of electric stoves, they find male resistance in using electricity for cooking because it is more expensive compared to free firewood (Koskela and Uman, 2015; Winther, 2008).

2.4.4 Institutional Challenges

One important condition commonly cited in the literature for the successful development of rural electrification projects is the need for good coordination among different institutions dealing with electrification issues. This represents a fundamental pre-requisite in order to guarantee that everyone has potential access to electricity (Rahman, Paatero, Poudyal and Lahdelma, 2013). Lack of coordination as well as unclear financing mechanisms can cause the failure of the project and may prevent shares of the population to have direct access to the electricity source. For example, in Ethiopia, government policy stresses the significant role of rural electrification in improving the quality of life in rural areas but, at the same time, the electrification process is left to the electric utility company without an appropriate budget provision from the government (Rahman et al., 2013). (Mariam, 1992). In the case of South Africa's electrification programme, the policy of providing electricity specifically to rural households has not been successful for reasons related to the availability of subsidies. In 2008, Eskom, the national power provider, launched a programme to subsidize solar water heating, but the subsidy level was too low, not clearly organized, required massive administration and control systems, and the programme has had little success. The implementation of renewable energy has been slow and the share of renewable energy in power supply is still insignificant (Niez, 2010; Azimoh, Klintenberg, Wallin, Karlsson and Mbohwa, 2016).

Case studies on the electricity projects in Africa by the Global Network on Energy for Sustainable Development (GNESD, 2006) tried to explain the slowness of the electrification process showing the inadequacy of market-oriented policies which negatively affected the rate of rural electrification. For instance, the rural electrification rate in Kenya decreased from 16 percent in 1993 to 8 percent in 2001 and Zambia recorded no significant improvement in the level of access to electricity in rural areas between 1990 and 2000, with access remaining at about 2 percent (Pellegrini and Tasciotti, 2013). Although China has made major efforts to restructure its energy system and has provided electricity to its remote areas, the country continues to present a strong urban-rural difference in electricity consumption with 11.5 million people still lacking electricity (Palit, 2013). One of the main problems faced by the Chinese government in providing electricity in rural areas has been the pricing mechanism for electricity prices are still set by the government, meaning that power suppliers are not assured the necessary profits (Palit, 2013). This particularly affects the long-term investment security for investors in providing electricity. The Yunnan Province, the province with the highest rate of

non-electrified households, is an example of this because it demonstrated that rural end-users limited their monthly electricity consumption to a level that made it completely unattractive to the electricity company to invest further in infrastructure and maintenance (Palit, 2013).

In most Asian countries, measures taken alongside or before reforms helped to widen access to electricity. In the Philippines, the reform measures facilitated an increase in the electrification process, with the rural electrification rate increasing from 2 per cent prior to 1998 to 3.5 per cent between 1998 and 2002 (Palit, 2013; Pellegrini and Tasciotti, 2013). In Vietnam, the establishment of a special government department, created ad hoc in 1995 to follow rural electrification projects, helped increase the level of electricity access in rural areas from 50 per cent in 1993 to 77 per cent in 2001, and the rural electrification rate from 2.1 to 9.9 per cent during the same period (Pellegrini and Tasciotti, 2013). Naturally, government programmes in developing countries are not always marked by failures and there are many success stories: in Thailand, over 90 per cent of rural households do have electricity and in Costa Rica, cooperatives and the government electricity utility provide electricity to over 95 per cent of the rural population. In Tunisia, over 85 per cent of rural households already have a supply (Palit, 2013; Pellegrini and Tasciotti, 2013).

Table 1 below depicts electrification which is split between urban and rural context.

Table 1: Global Statistics of Electricity Access in 2009

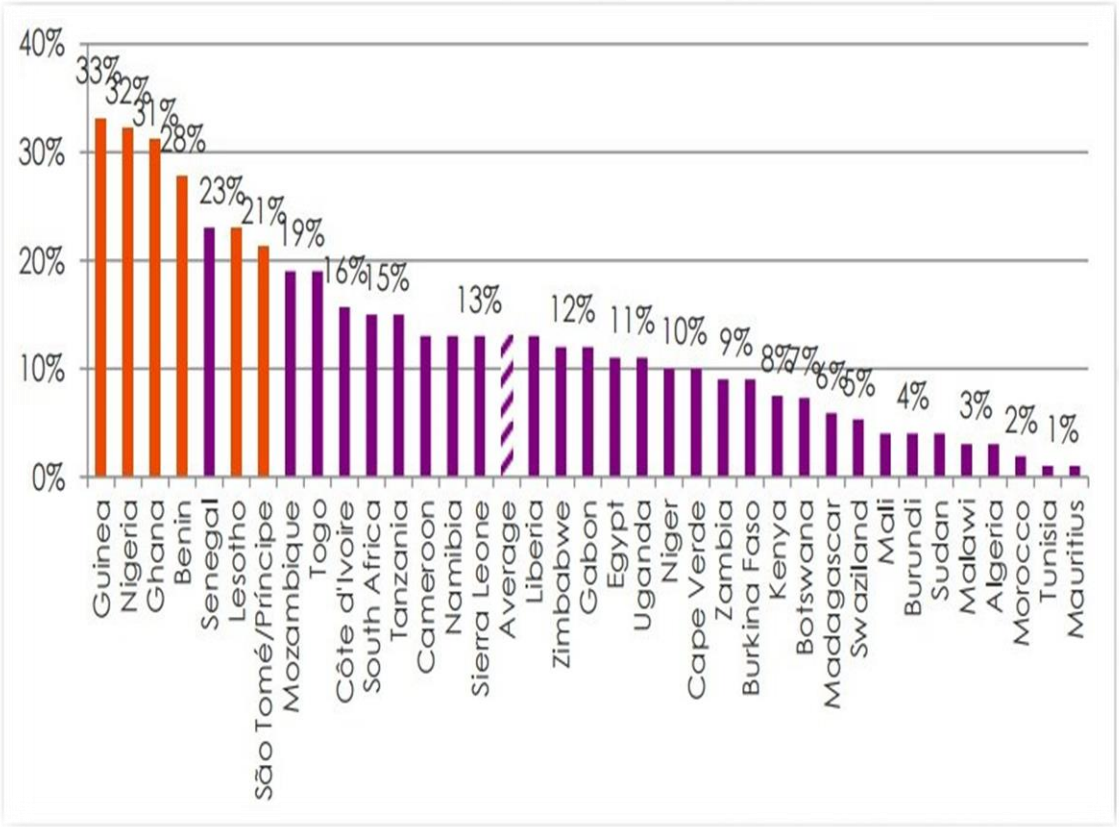
Area	Population without Electricity (in Million)	Electrification Rate (%)	Urban Electrification Rate (%)	Rural Electrification Rate (%)
Africa:	587	41.9	68.9	25.0
North Africa	2	99.0	99.0	98.4
Sub-Saharan Africa	585	30.5	59.9	14.3
Developing Asia:	799	78.1	93.9	68.8
China & East Asia	186	90.8	96.4	86.5
South Asia	612	62.2	89.1	51.2

Latin America	31	93.4	98.8	74.0
Middle East	22	89.5	98.6	72.2
Developing Countries	1,438	73.0	90.7	60.2
Transition Economies and OECD	3	99.8	100.0	99.5
World	1,441	78.9	93.6	65.1

Source: International Energy Agency (2010).

Below is a graph 1 which focuses on electrification in Africa.

Graph 1: Statistics of African Electrification



Source: Haden, 2016

From Table 1, about two-thirds of Africans live in areas with access to an electric grid. In some countries, seven in 10 citizens and as many as nine in 10 citizens in rural areas do not actually have access to electrification. Actual household connections to the grid are somewhat lower (60% on average), and equally variable across countries (Haden, 2016). Afro barometer has documented the reach and quality of electrical connections through nearly 54,000 interviews in 36 African countries. South Africans know that being connected to the grid does not mean the lights are always on. On average, only 69% of connected households actually have electricity that works most or all of the time. South Africa is not nearly the worst when it comes to a reliable supply (Haden, 2016). In Nigeria, while 96% of households are connected, only 18% of these connections function more than about half the time.

In Ghana, where "dumsor" (Akan for "off-on" or as we in South Africa know it, load shedding) has become a household word, 87% of households are connected, but only 42% of those connections provide reliable power (Haden, 2016). Yet that's still three times the rate of well-functioning connections in Guinea (12%). In South Africa, with 95% connected to the grid, 79% of respondent said that their electricity works "most of the time" with 13% saying their electricity only works occasionally or never and 5% saying it works "about half the time" (Haden, 2016). Unsurprisingly, South Africans' approval rating of the government's handling of electricity dipped sharply in 2014/15. From 64% being satisfied to 45% being satisfied. This was lower than the last time rolling blackouts became part of everyday life (48% in 2008/09). But electricity is not the biggest problem facing South Africans with only 15% saying it is their biggest issue. Guinea (33%) cite it as one of the three most important problems, Nigeria (32%), Ghana (31%), and Benin (28%) rank electricity in their top three issues, but overall it's far behind unemployment (38%) and education (32%) but ahead of corruption, housing, and political violence (Haden, 2016).

According to a report by the statistician-general of South Africa on electrification for the year ended June 2015, the percentage of South African households which were connected to electricity increased from 77.1% in 2002 to 85.5% in 2015 (Haden, 2016). It will be noted from Table 3 above that the small increase in new connections in Western Cape is due to the high baseline of households electrified. The decline noted in Gauteng is linked to the high level of migration to the province and the resultant creation of informal dwellings. The Department of Energy (DoE) will engage the Department of Human Settlements to come up with a plan on how to expedite the electrification of informal settlement growth in the Western Cape and

Gauteng. The percentage of households that used electricity for cooking increased from 58% in 2002 to 78.1% in June 2015 (Haden, 2016). Table 2 below reflect progress in terms of access to electrification in the different provinces in South Africa in 2015.

Table 1 below depicts a progress report of South African electrification in 2015.

Table 2: Progress Report of South African Electrification in 2015

Province	**Increase in Access to Electricity**
Eastern Cape	27%
Limpopo	20,4%
KwaZulu-Natal	12,8%
Mpumalanga	11,9%
Western Cape	<2%
Gauteng	-3,9%
Northern Cape	–
North West	–

Source: Haden (2016)

It is noteworthy that an increase in rural electrification has an impact on the decline in the use of paraffin and firewood. In South Africa, the percentage of households that used paraffin declined from 16.2% in 2002 to 5.4% in 2015, while the percentage of households that used firewood decreased from 19.3% to 9.3%. The percentage of households that used gas increased from 2.2% in 2002 to 3.5% in 2015 (Haden, 2016).

2.5 Delays in Completion of Electrification Project

Projects are considered delayed when their stipulated completion durations have not been achieved (Jacob, 2013). Delays are frequent occurrences in developing countries such as Thailand, Pakistan, Saudi Arabia, Nigeria and Egypt, Hong Kong, Malaysia and Vietnam respectively (Sunjka and Jacob, 2013). Pourrostam, Ismail and Mansounejad (2011), remark that project delays are the biggest challenges for the construction industry in developing countries. Delays are, however, not only experienced in the developing countries, they are

global phenomena (Sunjka and Jacob, 2013). Delays could be defined as time overrun either beyond the completion date specified in the contract or beyond the date that parties agreed upon for delivery of the project (Salunkhe and Patil, 2014). In most construction projects, the best possible performance is unachievable with poor productivity resulting in time overrun and consequently cost escalation of the projects. Singh (2010) studied delays and cost overruns in 894 projects from 17 infrastructure sectors. According to a study conducted in Delhi, delays are one of the crucial causes behind the cost overrun. The bigger projects have experienced much high cost overrun compared to smaller ones. According to Saleh, Abdelnaser and Abdul (2009), construction delay is a critical function in construction projects and also one of the biggest problems construction firms face in Libya.

According to the study conducted in Libya, the items of contractor's factors that cause delay and gave ranking based on the mean value criteria and in further analysis they identified the impact of delay in construction projects i.e. loss of interest by stakeholder, blacklist by authorities, waste of money and time and declination of reputation. Mohamad (2010) studies the factors and effects of delay in a government construction project. Research indicates that, the most important causes of delays from 45 different causes and 5 different effects of delays. They were cost overrun, rescheduling and rearrangement, litigation, disputes and arbitration.

2.6 Types of Delays

Theodore (2009) stated that there are four basic ways to categorize the type of delays:

- Critical or noncritical
- Excusable or non-excusable
- Compensable or non-compensable
- Concurrent or non-concurrent

2.6.1 Critical Versus Non-Critical Delays

Delays that affect the project completion, or in some cases a milestone date, are considered as critical delays, and delays that do not affect the project completion, or a milestone date, are noncritical delays. If these activities are delayed, the project completion date or a milestone date will be delayed (Wei, 2010). The determining which activities truly control the project completion date depends on the following:

- The project itself
- The contractor's plan and schedule (particularly the critical path)
- The requirement of the contract for sequence and phasing
- The physical constraint of the project, i.e. how to build the job from a practical perspective

2.6.2 Excusable versus Non-Excusable Delays

All delays are either excusable or non-excusable. An excusable delay is a delay that is due to an unforeseeable event beyond the contractor's or the subcontractor's control (Wei, 2010). Normally, based on common general provisions in public agency specifications, delays resulting from the following events would be considered excusable:

- General labor strikes
- Fires
- Floods
- Acts of God
- Owner-directed changes
- Errors and omissions in the plans and specifications
- Differing site conditions or concealed conditions
- Unusually severe weather
- Intervention by outside agencies
- Lack of action by government bodies, such as building inspection

Non-excusable delays are events that are within the contractor's control or that are foreseeable. These are some examples or non-excusable delays:

- Late performance of sub-contractors
- Untimely performance by suppliers
- Faulty workmanship by the contractor or sub-contractors
- A project-specific labor strike caused by either the contractor's unwillingness to meet with labor representative or by unfair labor practices

2.6.3 Compensable Delays versus Non-Compensable Delays

A compensable delay is a delay where the contractor is entitled to a time extension and to additional compensation. Relating back to the excusable and non-excusable delays, only excusable delays can be compensable. Non-compensable delays mean that although an excusable delay may have occurred, the contractor is not entitled to any added compensation resulting from the excusable delay (Wei, 2010). Thus, the question of whether a delay is compensable must be answered. Additionally, a non-excusable delay warrants neither additional compensation nor a time extension. Whether or not a delay is compensable depends primarily on the terms of the contract. In most cases, a contract specifically notes the kinds of delays that are non-compensable, for which the contractor does not receive any additional money but may be allowed a time extension. (Wei, 2010)

2.6.4 Concurrent Delays versus Non- Concurrent Delays

The concept of concurrent delay has become a very common presentation as part of some analysis of construction delays. The concurrency argument is not just from the standpoint of determining the project's critical delays but from the standpoint of assigning responsibility for damages associated with delays to the critical path. Owners will often cite concurrent delays by the contractor as a reason for issuing a time extension without additional compensation. Contractors will often cite concurrent delays by the owner as a reason why liquidated damages should not be assessed for its delays. Unfortunately, few contract specifications include a definition of concurrent delay and how concurrent delays affect a contractor's entitlement to additional compensation for time extension or responsibility for liquidated damages. (Wei, 2010)

In analyzed concurrent delays, each delay is assessed separately and its impact on other activities and the project duration is calculated. There are some guidelines for concurrent delays classification. Firstly, if excusable and non-excusable delays occur concurrently, only a time extension is granted to the contractor. Next, if excusable with compensation and excusable without compensation delays occur concurrently, the contractor is entitled to a time extension, but not to damages. Lastly, if two excusable with compensation delays occur concurrently, the contractor is entitled to both time extension and damages. In addition, although the guidelines are useful for the purpose of carrying out the delay analysis, it is in the best interest of all parties involved in a construction project to agree, in the beginning, the definitions of such delays and

accommodate them throughout the contract language. There was no reliable method to differentiate the impact of contractor caused delays from client caused delays until the development of CPM schedule analysis is developed. By the availability of sophisticated computerized techniques, the possibility to segregate the impacts of apparently concurrent client and contractor delays would be higher. (Wei, 2010).

2.7 Factors that Cause Delays in Electrification Projects

Electrification projects in some African societies are usually delayed as a result of many factors such as:

2.7.1 Managerial Incompetence

Lack of proper organising and planning skills has contributed to a disruption in the smooth running of the contractor firms. According to Hodgson and Gwagwa (2013:26), planning can be described as a series of actions that are designed to achieve the desired outcome. Hauptfleisch (2012:33) pointed out that without proper planning skills, a contractor will not able to properly decide what needs to be done, by who and when.

2.7.2 Poor financial Forecasting and Project Pricing

Some contractors delay completion of electrification projects because of poor project pricing mechanism and poor financial forecasting. Dlungwana, Noyana and Oloo (2014:47) observed that more often contracting firms lack the capacity to carry out a proper bill of quantities. Contractors also face human resources deficiencies to do a proper and accurate financial forecasting of project costs and revenues by incorporating statistical and scientific models of cost extrapolation and estimation. This often works to their disadvantage as they often bid projects far below cost recovery or break-even levels. This has led to under-pricing of projects and incurring resultant losses.

2.7.3 Poor Supply Chain Management

Supply chain management is seen as a concept that involves the sourcing of materials, transportation, storage and processing of acquired materials into desired products. Poor supply chain management contributes to losses by service providers like those involved in electrification projects given that uncoordinated and unsystematic purchases often lead to cost

escalation and project losses. Dlungwana et al. (2014:47) lamented that most African service providers do not incorporate best practices in inventory management such as calculating the Economic Order Quantity (EOQ) maximum and minimum re-order levels of inventory whose main purpose is to reduce inventory storage costs and losses. This unintentionally often leads to unsustainably high costs and reductions in profitability.

2.7.4 Insufficient Capital

The financial challenges encountered by African electrification service providers are also mainly due to the low-profit margins that they get from the projects that they undertake due to the machinations of the open tender system which often results in the lowest bidder getting the award for the tender (Theron, 2013:47). This also added to the financial woes of electrification project providers in that they will be unable to adequately pay their workers market-related salaries, grow their operations or purchase the latest machinery. Due to the vagaries of both the African economy real demand for contractor services in the market is always fluctuating to such an extent that contractors may often go for months or even years without getting a tender to provide services (Malongane, 2012:35). This problem was further exacerbated by the global economic crisis which resulted in national governments and local municipalities facing liquidity challenges and shelving capital projects for future years. Small and medium contractors are facing increased competition due to the long-term real decline in demand, and many contractors have responded by shedding labour.

2.7.5 Corruption Issues

Considering the point of Malongane (2012:35), there have been numerous complaints from tender bidders about alleged tendencies by government and other quasi-government officials to demand substantial amounts of money in the form of bribes. Dlungwana et al. (2014:47) contended that African electrification service providers have been thrown out of business by large conglomerates that are fronting historically disadvantaged individuals in Africa to get tenders.

2.7.6 High Staff Turnover

Cooper (2013:27) investigated causes of delay in 130 rural electrification projects in KwaZulu-Natal, Eastern Cape and Mpumalanga provinces by interviewing municipal officials and

service providers. This study did not interview employees of Eskom. Major findings reveal that managerial incompetence, poor financial and inventory management, high staff turnover and poor employee remuneration were part of impediments to electrification project implementation. The reasons for the failure to attract and retain experienced, qualified, and skilled employees are numerous. At times, public sector institutions like Eskom takes too long to pay contractors due to complicated and lengthy procedures such that these rural electrification service providers often experience cash liquidity challenges which in turn leads to failure to pay employees on time (Banks, Willemse and Willemse, 2011:7).

2.7.7 Inadequate Funding

One of the main challenges affecting a project manager's performance and project success is inadequate funding for electrification projects by government and local authorities (Mottiar and George, 2012:9). By definition, rural areas have significantly lower population density than urban centres, and they are often characterized by lower incomes; less access to primary education, health services, and clean water; and either minimal or no existing commercial electric service (Mottiar and George, 2012:9). Due to lower population density, often lower income, and concurrently lower specific energy consumption for rural communities, rural distribution systems realise far lower revenue per kilometre of rural distribution line than their urban counterparts (Mottiar and George, 2012:9).

2.8 Impacts of Delays on Project Completion

In the study of Manavazhia and Adhikarib (2002), delays in the delivery of materials and equipment to construction sites are often a contributory cause to cost overruns in construction projects in developing countries. The actual impact of these delays on project costs was found to be on average, only about 0.5 per cent of the total budgeted cost of the projects (Wei, 2010). Rural areas of poor countries are often at a disadvantage in terms of access to electricity. The high cost of providing this service in low populated, remote places with difficult terrain and low consumption result in rural electricity schemes that are usually more costly to implement than urban schemes (Wei, 2010). In addition, low rural incomes can lead to problems of affordability, and the long distances mean greater electricity losses and more expensive customer support and equipment maintenance. Despite this, rural electrification has been claimed to have substantial benefits, promoting production and better health and education for households (Wei, 2010).

Another issue of concern is indoor air pollution. Approximately 2.8 billion people worldwide rely on solid fuels for cooking, lighting, and heating. These fuels are usually burned inefficiently, both as biofuels for cooking and kerosene lighting, which results in substantial emissions of air pollutants that affect human mortality and morbidity rates (Barron and Torero, 2014). As the main source of indoor air pollution, cooking with biomass has received the most attention in the literature, and significant efforts have been made to improve cooking practices. Kerosene has received less attention, despite being used to light approximately 300 million households worldwide. Kerosene emissions include fine particular matter (particles with aerodynamic diameter ≤ 2.5 μm; PM2.5), carbon monoxide (CO), nitric oxides (NOX), and sulphur dioxide (SO2) (14-16) (Barron and Torero, 2014). Kerosene-burning devices can impair lung function and increase cancer risks as well as the incidence of infectious illness and asthma. There is extensive evidence that indoor air pollution is strongly linked to human health, especially among children, and that the presence of pollutants related to kerosene in the environment is also related to human health. In addition, kerosene lamps have important environmental consequences. It is estimated that these devices are responsible for 7 percent of annual global black carbon emissions (Barron and Torero, 2014).

The rural electrification project in El Salvador in Barron and Torero (2014) offers a unique opportunity to identify a causal relationship between access to electricity and the levels of indoor pollution driven by a change in lighting sources. Barron and Torero (2014) find that household electrification is associated with large and significant reductions in overnight concentrations arising mainly from reductions in kerosene use, effects that are maintained at least two years after electrification. They found increases in the time allocated to non-farm work activities for males and higher overall income arguably driven by this reallocation of labor. In addition to decreases in coping cost (like kerosene expenditures and expenses to charge batteries), they find that the decreases in indoor pollution cause a decrease of acute respiratory infections in children (Barron and Torero, 2014).

Furthermore, two recent studies examine the long-term effects of electrification, both using data from India. Rud (2012) uses a 20-years-panel of Indian states, of which many receive access to the electricity network in the course of the observed period. He uses groundwater availability as a predictor for network expansion (since water pumps played an important role in the green revolution) and hence a source of exogenous variation. He finds considerable positive effects of electricity access on the states' manufacturing output. Rud (2012) ascribes

this result in an increase in business activities of existing firms, but also to the creation of new firms. Van de Walle et al. (2013) examine long-run effects at both regional and household level for the Indian grid roll-out program. Using data sets from 1982 and 1999 on a study population in which the connection status increased substantially in between these two surveys, they find long-term effects on both connected households and positive spillover effects on non-connected households in connected communities. Consumption increases, as well as school enrolment rates and years of schooling, improve for girls. Moreover, both men and women supply more labor. According to Van de Walle et al. (2013), men shift leisure time from daytime to evening hours and offer more regular work during daytime. Women, in contrast, offer more casual work, which might as well include unpaid domestic work. Wages do not increase significantly in their sample. Lipscomb et al. (2013) investigate the long-run effects of the expansion of the electricity network in Brazil on economic development on the county level between 1960 and 2000. Similar to Dinkelman (2011), they use an exogenous program placement instrument to identify the impacts. They find large effects on the counties' Human Development Index and average housing value as a proxy for improvements in living and working condition in a county. As the relevant mechanism behind this, they identify the positive effects of electricity access on employment and income as well as literacy and school enrolment.

In addition, using household data from Nicaragua and an instrumental variables approach, Grogan and Sadanand (2013) explore rural electrification's effect on labor market participation. They find that agricultural activities decrease significantly, whereas non-farm salary work increases. In particular, women in rural areas are more likely to take up work outside their homes. Khandker et al. (2013) study a World Bank rural electrification program in Vietnam implemented between 2000 and 2005. Using a two-period household panel data set with an electrification intervention that affected parts of the sample in between the two surveys, they examine income-related and educational outcomes with a fixed effects model. They find that various income measures are positively affected: farm and non-farm income, wages, and expenditures. For both boys and girls, school enrolment and total years of schooling increase. The latter comes as a surprise given the short period the newly connected communities have been using electricity. The authors themselves emphasize the particularity of Vietnam as a very fast growing country that might bear better potentials for economic development following to electrification than others.

Likewise, Khandker, Barnes and Samad (2012) use a large cross-sectional household survey in Bangladesh and an instrumental variables approach to study the effects of electricity access on income, expenditures and investments into education. Khandker et al. (2012) observe a quite substantial increase in income and expenditures as well as completed schooling years for both boys and girls. Another indicator they examine is the study time of school children at home, which is frequently mentioned as an early indicator for investments into education triggered by electrification (Khandker et al., 2012). The transmission channel is the facilitation of reading after nightfall through improved lighting. In fact, they find that schoolboys study around 22 minutes more and girls around 12 minutes more per day. School children's home study time is also investigated in Barron and Torero (2014), who exploit exogenous variation introduced by randomly assigned vouchers on connection fees in El Salvador. They find an increase in total study time per day for both school boys and girls of around 10 minutes. For adults, they observe an increased engagement of males in non-agricultural activities leading to a substantial increase in income (34 percent more than at baseline). Barron and Torero (2014) also analyze the effect of electrification on respiratory diseases. The transmission channel here is that, in the absence of electricity, most households in El Salvador use kerosene for their lighting needs, which in turn leads to emissions of soot that is harmful to the exposed people. In fact, in their sample, the electrification treatment leads to a concentration of harmful pollutants that is 63 percent lower than in the control group, which furthermore translates into a reduction of respiratory infections.

2.9 Strategies for Improving Electrification Project

Delays can be prevented by applying methods which can be implemented from the project commencement itself like planning and analyzing the requirements in detail which will allow the mapping of resources. The risk can be identified to allow the estimation and allocation of works which is required to be modularized. Escalation of issues at the appropriate times also ensures that the delays can be prevented. The prevention of delays is possible when all the project stakeholders work as a team to ensure the success of the project. It is also important for the client to employ a proactive consultant, freeze the design and details before the commencement of the project and employ well-reputed contractors for the project. A detailed strategy is outlined below.

2.9.1 Plan/Analyse the Requirements in detail.

The construction industry has to implement new ways of working to be competitive to meet the demands of the clients. Working in collaboration is essential for the design and construction teams during the complete lifecycle of the project. Also, it is now recognized that good collaboration does not result from the implementation of information technology solutions alone, the organizational and people issues, which are not readily solved by pure technical systems, need also to be resolved (Enshassi, Kochendoerfer and Ghoul, 2016). The collaboration between individuals related to different fields is a more difficult task and it does not happen by implementing techno-solutions. The requirements of the construction sector are gathered through literature, interviews and questionnaires to develop a methodology for the working in collaboration effectively for the construction sector. The main issue emerging from this analysis is that the softer issues need more attention than the issues related to technology to ensure that the plan and implementation of collaborative working are more effective in projects (Enshassi et al., 2016).

2.9.2 Map Available Resources

The key to the successful completion of any project is the optimum utilization of the resources and by achieving the productivities as planned in the schedule. Also, the deployment of the required resources at the appropriate time is absolutely essential in the success of any project (Kagiri and Wainaina, 2017). This mapping of resources for a project is the key to any projects success. In every project, there are key determinants for the performance of the construction program of works and these range from the project manager, project team, planning and monitoring team and cost control team. (Kagiri and Wainaina, 2017).

2.9.3 Perform Training and Knowledge Transfer

The projects completed on time or otherwise are a source of valuable information for the people who would undertake a similar project. The information would be the transfer of knowledge for the benefit of those who otherwise would encounter problems similar to those encountered by the earlier counterparts (Kagiri and Wainaina, 2017). Also, people who have encountered situations which needs to be known, so that others can take benefit from it can be done by performing training in such specific issues and matters. In projects, the decisions made by the

site personnel are important to the success and failure of the project. The decisions made on the field by the team dictates whether the profit margins are gained or lost hence the knowledge of planning and scheduling should be integrated at the field level (Kagiri and Wainaina, 2017). Profit margins are gained or lost by the field decisions, so the knowledge of planning, scheduling and managing project cost should be integrated into the field at all levels of supervision (Kagiri and Wainaina, 2017).

2.9.4 Identify Risks

For every project, whether it is a mega project or a small sized project, the identification of all the risks for that project is essential in initial stages. This will help in developing action plans to meet those risks and make all the stakeholders aware of their effects if not attended to at the initial stages itself. A realistic procedure is recommended to work out the size of the program for a project or a budget for an unforeseen risk at any stage of the project (Xie, AbouRizk and Zou, 2011). The size of the budget is a function of the number of risks expected at the specified confidence level. The number of risks used for developing the contingency budget depends on the total number of risks to be considered and the estimated probabilities of occurrence of the risks (Xie et al., 2011). The risks that are determined will also indicate whether impact may be major or marginal and the budget to be allocated accordingly. When the risks for a specific project are more than 20 or the exact number of risk that is calculated by a binomial distribution will be tabulated to indicate the exact number of risks. The findings indicate that a certain amount of budget should be allocated for small risks in a project which in any case would materialize. The exact number of risks would depend on the acceptance of the risk by the company (Xie et al., 2011). The risks that have to be identified and analyzed for any project from the list of probable risks is a problem where the decision lies with a multi-group regarding where to attribute the risk which is a problem. Conventional approaches to risk identification and risk analysis separately tend to be less effective in dealing with the imprecise of the risk analysis individually (Xie et al., 2011).

2.9.5 Estimation and Allocation

The estimation for any project is the key to profitability and the growth of the company. Accurate estimates will help in realizing the outputs with the proper allocation of resources that

are required for the project (Lu, Guo, Qian, He and Xu, 2015). Thus, the estimate for any project has to be accurate to the last detail to ensure competitiveness in the market. The ability to accurately forecast the cost of delivering a project is the key to a cost-based competition. The literature on cost estimation has focused on specific estimation methods as broad techniques and not much consideration has been given to the distinct requirement of each project (Lu et al., 2015). The author attempts to highlight the important factors for an effective estimation at different stages of the project. Drawing from organization control theory and cost estimating literature, this note develops a theoretical framework that identifies the critical factors for effective cost estimation during each project phase of a conventional construction project (Liu et al., 2007). The main logic is that with the progress of a cost estimate, the programming of the activities and the output measurement can be done in a better manner and the result will be that input oriented control will shift to output control (Lu et al., 2015).

2.9.6 Modularize work

Projects undertaken have to prepare a schedule of works in which the activities have to be sequenced in a logical manner to demonstrate as to how the works would be undertaken (Jun and El-Rayes, 2011). The aspect of allowing a logical sequence of works to proceed in a modular way is the best way to ensure the success of any project (Jun and El-Rayes, 2011). The project duration is normally fixed when the contract is signed. The details related to the individual activities durations are based on the elements like the quantities and other variables which can impact the estimate for the duration of the activity (Jun and El-Rayes, 2011). Thus, the progress of the project and its evaluation at various stages indicates whether the duration allowed for the activities are adequate or need revision or corrective action to ensure that the project remains on schedule. The project should implement a system that would integrate all the elements of the work and ensure that these are monitored for the performance (Jun and El-Rayes, 2011).

2.9.7 Escalate Issues

The project has numerous decisions to be taken and some are interlinked in such a way that without the decision being taken on one issue the other issue cannot progress. In such a case if the decision is pending from the client then it will be required to highlight the issue at an

appropriate time to ensure that there is no delay to the project. Unless and until the issue is escalated the client would not action the issue with urgency and this may lead to delays to other works as well as delay the project (Saeed, 2009). The issues related to quality and cost are essential for any project. Cost and quality are inseparable issues on any project (Saeed, 2009).

The generally perceived notion that 'quality' has a direct bearing on 'cost' to the owner is generally valid assuming all procedures are well managed and executed by all parties (Saeed, 2009). There are numerous stages in a project where a bad quality of works can result in rework or abortive works and increase the cost unless all the stakeholders understand the importance of quality. The typical areas which can lead to cost escalation are related to the owners' acquisition of the property, financing the project, planning and engineering through the consultant and construction and maintenance (Saeed, 2009). The design by the consultant can significantly affect the project and it is advisable to have a quality management program that includes all features of the professional's involvement to ensure the desired results.

In understanding rural electrification using contractors bring into the fore the notion of agency. This relates to the relationship between two parties, where one is a principal and the other is an agent who represents the principal in transactions with a third party. Agency relationships occur when the principals hire the agent to perform a service on the principals' behalf. Principals commonly delegate decision-making authority to the agents. Agency problems can arise because of inefficiencies and incomplete information. The theory is also applicable when there is uncertainty (Mwihaki, 2015). Under uncertain environments in the business world, two agency problems such as adverse selection and moral hazard may arise. Adverse selection is the condition under which the principal cannot ascertain if the agent accurately represents his ability to do the work for which he/she is being paid. Moral hazard is the condition under which the principal cannot be sure if the agent has put forth maximal effort to achieve the objective of the work being undertaken (Mwihaki, 2015). The agency theory places greater conceptual emphasis on the economic incentives of the contracting parties within the context of the principal-agent relationship (Mwihaki, 2015).

2.10 Summary

This chapter has provided an overview of electrification globally and locally. Globally, 1,456 billion people have no access to electricity of which 83% are in rural. The region most affected by the lack of electrification is Africa, specifically Sub-Saharan Africa. While some of the problems are country-specific, many of them are common to a number of developing countries. In South Africa, the apartheid created and perpetuated energy poverty which was off the policy agenda as it affected black people most. In post-apartheid South Africa, rural electrification is a critical issue which is not easy to implement.

This chapter has discussed some of the challenges of electrification projects in a variety of countries. The chapter has also discussed delays in electrification projects and the types of these delays. As rural electrification projects are implemented by contractors, the theory of agency is key as it relates to the relationship between two parties, where one is a principal and the other is an agent who represents the principal in transactions with a third party. Agency problems can arise because of inefficiencies and incomplete information, which may contribute, to delays in rural electrification projects. The next chapter discusses the research methodology used in this study.

CHAPTER THREE: METHODOLOGY

3.1 Introduction

The aim of this chapter is to discuss the research methodology used in this study to understand what contributes to delay in rural electrification projects in South Africa. Research methodology provides an orientation that influences the research results and influences the results' standing in the different research communities. It is therefore the responsibility of the researcher to provide evidence of the research methods applied and justification for the choice of these methods (Ellis and Levy, 2010). This chapter provides the research methods that were adopted to undertake this study. The first part presents a background study on the research locality and the research paradigm used. It explains the research design that was used to provide an explanation of the rationale for the choice of research design. This is followed by discussions on the target population, the sampling techniques, sampling procedures, pilot study, the instruments for data collection, how data was analyzed and presented, trustworthiness of the study and finally ethical considerations in the study.

3.2 Research Paradigm

Denzin and Lincoln (2011), define paradigms is a distinct set of concepts or thought patterns, including theories, research methods, postulates, and standards for what constitutes legitimate contributions to a field. In other words, paradigm relates to the philosophical and theoretical framework of a scientific school or discipline within which theories, laws, and generalizations and the experiments performed in support of them are formulated. Paradigms are thus important because they provide beliefs and dictates, which, for scholars in a particular discipline, influence what should be studied, how it should be studied, and how the results of the study should be interpreted (Kivunja and Kuyini, 2017: 26). A large number of paradigms have been proposed by researchers but Candy (1989) suggests that they all can be grouped into three main taxonomies, namely Positivist, Interpretivist, or Critical paradigms. However, other researchers such as Tashakkori and Teddlie (2011) propose a fourth that borrows elements from these three and is known as the Pragmatic paradigm.

The Positivist paradigm defines a worldview to research, which is grounded in what is known in research methods as the scientific method of investigation. Comte (1856) postulated that experimentation, observation and reason based on experience ought to be the basis for

understanding human behaviour, and therefore, the only legitimate means of extending knowledge and human understanding. The Critical paradigm situates its research in social justice issues and seeks to address the political, social and economic issues, which lead to social oppression, conflict, struggle, and power structures at whatever levels these might occur (Kivunja and Kuyini, 2017). Because it seeks to change politics so as to confront social oppression and improve social justice in the situation, it is sometimes called the Transformative paradigm. This paradigm assumes a transactional epistemology, (in which the researcher interacts with the participants), an ontology of historical realism, especially as it relates to oppression; a methodology that is dialogic, and axiology that respects cultural norms (Kivunja and Kuyini, 2017).

The pragmatic paradigm arose among philosophers who argued that it was not possible to access the 'truth' about the real world solely by virtue of a single scientific method as advocated by the Positivist paradigm, nor was it possible to determine social reality as constructed under the Interpretivist paradigm (Kivunja and Kuyini, 2017). For them, a mono-paradigmatic orientation of research was not good enough. Some philosophers argued that what was needed was a worldview which would provide methods of research that are seen to be most appropriate for studying the phenomenon at hand (Alise and Teddlie, 2010; Biesta, 2010; Tashakkori and Teddlie, 2011). So, these theorists looked for approaches to research that could be more practical and pluralistic approaches that could allow a combination of methods that in conjunction could shed light on the actual behaviour of participants, the beliefs that stand behind those behaviours and the consequences that are likely to follow from different behaviours (Kivunja and Kuyini, 2017).

3.2.1 The Interpretivist Paradigm/Constructivist Paradigm

For the purpose of this research, the interpretivist Paradigm/Constructivist Paradigm was adopted. The central endeavour of the interpretivist paradigm is to understand the subjective world of human experience (Lincoln, Lynham and Guba, 2011). This approach makes an effort to 'get into the head of the subjects being studied' so to speak, and to understand and interpret what the subject is thinking or the meaning he/she is making of the context (Lincoln et al., 2011). Hence, the key tenet of the interpretivist paradigm is that reality is socially constructed (Antwi and Hamza, 2015). This is why sometimes this paradigm has been called the

Constructivist paradigm. In this paradigm, theory does not precede research but follows it so that it is grounded on the data generated by the research act. Hence, when following this paradigm, data are gathered and analysed in a manner consistent with grounded theory (Petty, Thomson and Stew, 2012). The interpretivist paradigm will be embraced to allow participants to give detailed and rich data for the study.

According to Lincoln and Guba (1985), and Morgan, (2007), research conducted under the interpretivist paradigm usually exhibits the following characteristics:

- The admission that the social world cannot be understood from the standpoint of an individual.
- The belief that realities are multiple and socially constructed
- The acceptance that there is inevitable interaction between the researcher and his or her research participants
- The acceptance that context is vital for knowledge and knowing.
- The belief that knowledge is created by the findings can be value-laden and the values need to be made explicit
- The need to understand the individual rather than universal laws.
- The belief that causes and effects are mutually interdependent.
- The belief that contextual factors need to be taken into consideration in any systematic pursuit of understanding.

3.3 Research Design

According to Du Toit and Mouton (2013) (1996: 175), the research design serves to "plan, structure and execute" the research to maximise the "validity of the findings". It gives directions from the underlying philosophical assumptions to research design and data collection. Yin (2017: 19) adds further that "colloquially a research design is an action plan for getting from *here* to *there*, where 'here' may be defined as the initial set of questions to be answered and 'there' is some set of (conclusions) answers."

This study is an exploratory one which aims to explore the factors that cause delays in electrical distribution projects at Eskom, KwaZulu-Natal province and investigate how these problems can be minimized. Exploratory research studies are also termed as formulative research studies. The main purpose of such studies is that of formulating a problem for more precise

investigation or of developing the working hypotheses from an operational point of view (Kothari, 2004: 35). The study obtained data through qualitative measures to answer the research questions. Qualitative research can be used in circumstances where relatively little is known about the phenomenon (Gray, 2014: 162). In this regard, the qualitative approach was useful to get in-depth knowledge about the limiting factors that cause delays in the completion of electrification projects. The current study is qualitative as it explored the challenges from the subjective viewpoint of project managers and coordinators to fathom what actually contributes to delays in rural electrification in KwaZulu-Natal.

3.4 Qualitative Research

This study used a qualitative research methodology for collecting and analysing data on delays in the completion of electrification projects. The rationale for choosing a qualitative research approach was premised on two main reasons. Firstly, qualitative research methodology produces detailed descriptions and analysis of information. Secondly, limitations of time and costs necessitate a qualitative research approach mainly because it deals with smaller samples. The qualitative research approach was therefore chosen since it is the best approach to explore and gain in-depth insights on the factors that cause delays in the completion of electrification projects in KwaZulu-Natal operating unit.

3.5 Target Population

Target population refers to "the full set of cases from which a sample is taken" (Saunders *et al.* 2009:212). In this study, all the employees who worked as project managers and coordinators at Eskom`s electrification department in KwaZulu-Natal were the target population. There was a total number of 63 employees who worked as project managers and coordinators at KZN. The study excluded project managers and coordinators working in Eskom distribution operating units in other provinces such as Gauteng, Eastern Cape, Western Cape, Mpumalanga, Northern Cape, Limpopo, North West, and Free State. It is in this way that the study is delimited to Eskom Electrification department at KwaZulu-Natal operating unit to explore challenges with rural electrification projects.

3.6 Sample and Sampling Techniques

This section discusses the sample population, sampling technique and sample size.

3.6.1 Sample Population

A population is a group of persons, items or objects from which samples are taken for measurement (Bless et. al., 2013). It also refers to an entire group of individuals or elements that have at least one thing in common (Bless et. al., 2013). Eskom electrification department has a total number of 63 employees among the population.

3.6.2 Sample Size

The sample size was 10 employees out of 63 employees in the electrification department at Eskom Westville office. Below is a discussion of how the ten participants were selected in this study.

3.6.3 Sampling Methods

Kumar (2014) defines sampling as the process of selecting a few samples from a larger group of people as the basis for predicting the occurrence of an unknown piece of situation or gathering information about the larger group under study. There are two types of sampling techniques that researchers can use (Kumar,2014). First probability sampling is when the chance or probability, of each participant being selected from the population is known and every participant stands an equal chance of being selected. Second, non-probability sampling is when the probability that each participant will be selected is unknown. Non-probability sampling is cheaper, faster, and often adequate for homogenous populations (Bless et al., 2013: 166). There are various techniques that can be used for probability and non-probability sampling (Kumar,2014).

Various techniques can be employed in non-probability sampling, such as quota, snowball, convenience, purposive and self-selection. In this study, purposive sampling was the specific technique that was used. In purposive sampling, the researcher picks participants based on criteria which makes one most suitable and relevant to a study based on distinctive characteristics such as experience, attitudes or perception. Judgmental sampling is also known

as purposive sampling procedure (Sarantakos, 2005). Purposive sampling technique purposely chooses subjects who are relevant to the research project. Creswell (2012:17) points out that purposive sampling is a technique widely used in a study that is qualitative in nature for the documentation as well as a selection of information-rich cases for the most effective use of limited resources. The choice of participants in this study was guided by the following criteria (1) participant with hands-on experience of various rural electrification project implementation in KwaZulu Natal; (2) participants with not less than five years of experience with Eskom dealing with rural electrification projects in KwaZulu Natal and (3) being able and willing to reflect on what contributes to delays in rural electrification project.

3.7 Pilot Study

A pilot study is a small-scale methodological test conducted to prepare for a study and is intended to ensure that methods or ideas would work in practice (Jariath et al., 2000; Prescott and Soeken, 1989; van Teijlingen and Hundley, 2002). The principal benefit of conducting a pilot study is that it provides researchers with an opportunity to make adjustments and revisions in the main study. Three project managers were purposively selected for the pilot study. After the pilot study, the interview questions were fine-tuned to primarily avoid repetition but also enhance clarity.

3.8 Instrument for Data Collection

The section below discusses how data was collected in this study.

3.8.1 Interview

Interviews are methods of gathering information through conversation using a set of pre-planned core questions. According to (Shneiderman and Plaisant, 2005), interviews can be very productive since the interviewer can pursue specific issues of concern that may lead to focussed and constructive suggestions.

The research strategy adopted for this research was mainly the use of semi-structured interviews. The data collection method employed in the study was the in-depth interviews with the project managers and project coordinators. This was ideal to get different views of different project managers and coordinators to reflect the variety of views regarding the delays related to rural electrification projects.

3.8.1.1 Advantages of the Interview

According to Gray (2014), Genise (2002), Shneiderman and Plaisant (2005) and Kumar (2011:142) some of the advantages of the interview method are:

- Direct contact with the participants which results in clear and practical suggestions,
- It is known to be a good approach in obtaining detailed information about a person's knowledge, attitudes, values and preferences on a particular issue.
- Only a few participants are carefully selected to collect richer information about the phenomenon. In this study, 10 participants were purposefully selected for interview from the electrification department.
- It can be used to test out a hypothesis or to identify variables and their relationships
- It can also be used in conjunction with other research instruments such as surveys, to try and make sense of the phenomenon under study.
- The interview is the most appropriate approach for studying complex and sensitive areas as the interviewer has the opportunity to prepare a respondent before asking sensitive questions and to explain complex ones to respondents in person.
- It is useful for collecting in-depth information. In an interview situation, it is possible for an investigator to obtain in-depth information by probing. Hence, in situations where in-depth information is required, interviewing is the preferred method of data collection.
- Information can be supplemented. An interviewer is able to supplement the information obtained from responses with those gained from observation of non-verbal reactions.
- Questions can be explained. The interviewer has the opportunity to repeat a question or put it in a form that is understood by the respondent.

- An interview can be used with almost any type of population; children, the handicapped, illiterate, or aged.

3.8.1.2 Disadvantages of the Interview

According to Gray (2014), Genise (2002), Shneiderman and Plaisant (2005) and Kumar (2011:142) some of the disadvantages of the interview method are:

- Interviewing is time consuming and expensive, especially when potential respondents are scattered over a wide geographical area.
- The quality of data depends upon the quality of the interaction between the interviewer and the interviewee.
- The quality of data depends upon the interviewer's skill, experience, and commitment of the interviewee.
- The quality of data may vary when many interviewers are used. Use of multiple interviewers may magnify the problems identified in the two previous points.
- The researcher may introduce his or her bias by the framing of questions and the interpretation of responses.

Interviews can be structured, semi-structured and unstructured depending on the requirement and design of the study, or it may take the form of focus-group interview. For the purpose of this study, semi-structured interviews were adopted. Semi-structured interviews are non-standardised, that lie between structure and unstructured interviews and are often used in qualitative research (Gray, 2014, Sarantakos, 2005). They contain elements of both structured and unstructured types; when some being closer to structured and others closer to unstructured types (Sarantakos, 2005). Therefore, the method that was utilised in this study has features of both structured and unstructured response categories comprising of open-ended questions.

In order to be consistent in the data gathering process with all respondents, a set of pre-planned questions were formulated in the interview schedule to understand factors that cause delays in the completion of electrification projects. The questions focused on factors which delay the completion of rural electrification projects. As the interview progressed, the participants were also given an opportunity to discuss extensively on the questions asked. Semi-structured interviews are known to provide an in-depth exploration of a phenomenon. In this study, semi-

structured interviews were key to capture the key informants' understanding of the factors that contribute to delays in completion of electrical projects at Eskom electrification department.

3.9 Data Analysis

The study analysed the interview data through thematic analysis by identifying common or recurring themes from the participants. Data were coded into different categories and themes reflecting factors, challenges, strategies, and recommendations regarding rural electrification

3.9.1 Qualitative Analysis

Qualitative data deals with data presented in words which contains a minimum of quantitative measurement, standardisation and statistical techniques (Thomson and McLeod, 2015), and it aims to interpret and transform data in a rigorous and scholarly manner (Thomson and McLeod, 2015). The process of analysis is more focussed, deep and detailed than in quantitative research (Thomson and McLeod, 2015). It is not mandatory that it must follow one process of what constitutes a standard analysis, unlike quantitative research (Sarantakos, 2005). Braun and Clarke (2006: 79) define thematic analysis as "a method of identifying, analyzing and reporting themes or patterns within data". The purpose of thematic analysis is to search through data to identify any recurrent patterns (Bryman, 2012).

Thomas (2008), cited in Royce (2011:165), outlined four steps in qualitative data analysis which are as follows:

1. The conversations, interviews or responses are transcribed and written down.
2. The source material is carefully read, and key segments of text are highlighted.
3. Themes or categories and subcategories are coded (identified).
4. Patterns which make sense of the most important themes or categories are sought. The researcher explains the significance of the themes or categories to the research participants.

3.9.2 Ethical Consideration

Bless (2013) states that the researcher has an obligation to respect the rights, needs, values and desires of the informants, in other words, ethical clearance has to be granted by the authority stating clearly that the researcher participates on his or her own accord and can opt out at any time if he or she wishes to do so. This study is an exploratory one which requires participants to share their experiences. In this case, informed consent was sought from participants by asking them to sign a consent form in order to show that they agree on their own accord. Confidentiality of the participants was kept by ensuring that participants' identities are not disclosed to anyone. Only the researcher and the researcher's supervisor have access to the participants' data. Moreover, the data is safeguarded to ensure that no one has access to it. Anonymity will also be ensured by giving the participants pseudo-names so that their identities are protected. Ethical clearance was sought from the University of KwaZulu Natal but also Eskom before approaching individuals for their informed consent.

3.10 Research Quality

Guba (1981) cited in Anney (2014) suggests that research conducted within the Interpretivist approach should follow four criteria of trustworthiness and authenticity. These include are credibility, dependability, confirmability and transferability. In order to ensure rigor in qualitative research, the concept of trustworthiness has been adopted by researchers. Trustworthiness in qualitative research entails the production of findings that reflect as close as possible the meanings described by the participants (Anney, 2014). The concept of trustworthiness evaluates the quality of qualitative research on the basis of four concepts: credibility, dependability, transferability and confirmability (Bless et al., 2013: 236). Studies with high credibility correspond to the concept of internal validity, they are those in which the researcher has convincingly demonstrated the appropriateness and overall internal logic of the research questions, the study design, the data collection method and the approach to data analysis used (Bless et al., 2013: 236). Credibility refers to the degree to which the research is valuable, consistent and convincing. This is achieved through utilising the triangulation method and member check. Triangulation is defined as "the use of more than one method or source of data in the study of a social phenomenon so that findings may be cross-checked" (Bryman, 2012:717). The researcher used member check as participants were given a chance to comment on the transcribed data (Bryman, 2012).

Dependability as a concept is similar to but not the same as reliability. Dependability is concerned with the consistency of the data, which indicates whether the findings would be consistent if the study were repeated with the same subjects in a similar context. The researcher kept the audio tapes, fieldwork notes and transcripts of the data collected to show that proper procedure had been followed. In this study, the researcher has also presented complete details of the research process or audit trail to ensure dependability. It demands that the researcher thoroughly describes and precisely follows a clear and thoughtful research strategy. When a researcher describes exactly how data was collected, recorded, coded and analyzed, and can present good examples to illustrate this process, one starts to trust that the results are in fact dependable (Bless et al., 2013: 237).

Transferability refers to the extent that research findings are transferable to a different situation or population than that of the initial study (De Vos et al., 2005). Transferability can be achieved when researchers provide detailed explanations of the context of the research undertaken, such that the readers can assess whether or not the outcomes can be transferred (Shenton, 2004). In this study, the researcher has provided full details on methods, roles, settings, and participants for readers to transfer findings to similar contexts. This type of information can assist any reader in assessing the relevance of the findings in relation to their own unique conditions (Barnes et al 2012). Information provided allows other researchers to compare and assess the similarities between that given situation and other settings or contexts, that is, on the transferability of the findings (Bless et al., 2013: 237).

Confirmability refers to the degree to which the findings are solely from participants and free from personal biases, motivation and interests of the researcher (Bless et al., 2013: 237). According to Bless et al., (2013: 237).), reflexivity refers to the researcher being aware of the expectations, hopes and attitudes she or he brings with the field; this is done to avoid the researcher influencing the participants' responses.

Further, it helps the researcher not to influence the findings with his or her values. In order to increase the confirmability of the findings, the researcher used the following procedure:

- Interruption was avoided as far as possible during the interviews
- The interviews were recorded on a voice recorder and in the form of notes, to ensure that key points were not missed.

- The research report has used direct quotations of what was actually said by project managers and coordinators in their own choice of word by word to express their views of challenges which delay rural electrification.

3.11 Summary

This chapter has discussed the research paradigm used in this study. The chapter has specified issues regarding sample and sampling techniques, data collection and analysis in this study. Purposive sampling of project managers and coordinators at Eskom in KwaZulu-Natal, semi-structured interviews and thematic analysis were used in this study. Issues of research quality and research ethics are all discussed in this study as well. In the next chapter, the focus is on findings of this study.

CHAPTER FOUR: RESULTS AND DISCUSSION

4.1 Introduction

The aim of this chapter is to present the results of this study regarding challenges which contribute to delays in rural electrification, strategies to reduce delays in rural electrification and recommendations.

The results are presented by focusing on three aspects, namely:

1. challenges faced at the level of project managers/coordinators which delays project completion at Eskom electrification department KZN-;
2. strategies which can be adopted by Eskom electrification department KZN-OU to reduce delays in project completion; and
3. recommendation to Eskom electrification department KZN-OU regarding completion of electrification projects on schedule and plan.

The chapter begins with a focus on the profile of research participants. This is followed by results on challenges faced at the level of project managers/coordinators which delays project completion at Eskom electrification department KZN-OU. Results on strategies which can be adopted by Eskom electrification department KZN-OU to reduce delays in project completion are followed by (4) recommendation to Eskom electrification department KZN-OU.

4.2 Demographic Profile of Respondents

Table 3 below indicates that 50 % of the participants in this study were females while the others were males. Five of the participants were project managers while the other 5 were project coordinators. All the participants in this study were African.

Table 3: Sample Characteristics of Respondents

Respondent	Race	Gender	Position
Respondent 1	African	Male	Project Coordinator (PC 1)
Respondent 2	African	Male	Project Coordinator (PC 2)
Respondent 3	African	Female	Project Coordinator (PC 3)
Respondent 4	African	Male	Project Coordinator (PC 4)
Respondent 4	African	Male	Project Coordinator (PC 5)

Respondent 6	African	Female	Project Manager (PM 1)
Respondent 7	African	Female	Project Manager (PM 2)
Respondent 8	African	Male	Project Manager (PM 3)
Respondent 9	African	Female	Project Manager (PM 4)
Respondent 10	African	Female	Project Manager (PM 5)

Given the above profile of research participants, the following were views regarding internal and external factors which cause delays in electrification projects by Eskom in KZN-OU.

4.3 Challenges in Project Completion Delays at Eskom Electrification Department KZN-OU

A variety of challenges that cause delays in the completion of electrification projects were identified in this study. These are categorized into internal and external challenges of electrification project according to project managers/coordinators.

4.3.1 Internal Challenges that cause Delays

Six themes which depict internal factors causing delays in electrification projects include

1. poor management and planning process
2. inadequate funding;
3. poor estimation of projects;
4. Lack of Integration among the Role Players
5. Insufficient and Late arrival of Materials;
6. Incomplete Packages;
7. Unfair Allocation of Work and
8. failure to use project management principles.

4.3.1.1 Poor Management and Planning Process

Participants stated that projects get delayed due to poor planning and management. In this instance project plan from the unset gets disrupted politically and changes the scope, and other things which need to be executed during execution are not well planned for. This leads to an

extension of time that will be spent on the project. With political intervention in mind, this is what one of the project managers had to say:

> *…and I think our managers are not strong enough to stand firm on the plan because they do have a plan but due to politics the plan that they have changed. If they can be strong enough I think they stand their grounds to say we understand the political part of the area but we have to stick with the plan… As Eskom electrification, we do not plan our projects by that I mean the electrification projects does not only include the electrification stakeholders only. It has other stakeholders like your planning department and politicians who change things… (PM 2) (PC 3)*

Poor management is also evident through inconsistencies in the funding and scope of what is expected to be actually done. Project coordinators focused on different ways in which funding was not aligned with engineering but also failed to embrace the scope of all the project activities and stakeholders.

> *It's not in line with our engineering/ processes, the funding model KZN-OU is using is not in line with our processes… (PC 1)*

> *…the other issue is when we plan we need to make sure that we cover all the customers within the project boundaries because sometimes we find that we can only do half of the customers or 75%.... (PC 2)*

Poor management also relates to technical challenges to ensure proper, complete and design work at the planning phase as revealed below.

> *…According to my view and based on my experience, most of our projects are delayed by improper planning at the ignition stage. Designs which are incomplete cause delays. Missing important documentation and end up taking incomplete designs to execution, starting at the planning phase… (PC 5).*

Planning as the initial cause of delay affects subsequent activities such as preparation of design and execution of the actual project. The chain of delays which is initiated by delays in planning carry over to other activities as revealed in this way.

> *It starts with planning, if our projects were planned in time and delivered in time to our network engineering design(NED) guys to prepare designs…. for an example in electrification we need to make sure we now come end of September each year, designs for the following financial year needs to be ready for execution. When I mean designs must be ready, it means package must be ready to be executed with everything including permits a whole lot, we know exactly what is required, the cost e.t.c. the planning needs to make sure come end of December each year concept release approval (CRA) is in the system, come*

> *beginning of April we hand in the full package to NED to commence the designs… (PM 3)*

Monitoring of projects is a key part of management. Project managers indicated that some project coordinators did not monitor construction programs.

> *Once we fail to acknowledge that there is construction programming, little monitoring is done. Project Coordinators are expected to constantly monitor that construction, but this is not done on a consistent basis (PC 1)*

The key to the successful completion of any project is the optimum utilization of the resources and by achieving the productivities as planned in the schedule. The findings of this study correlate with Hauptfleisch (2013:26) findings which state that historically disadvantaged contractors are found wanting when it comes to organising and planning the execution of their work to such an extent that service quality is compromised (Hauptfleisch, 2012:33). Lack of proper organising and planning skills has contributed to a disruption in the smooth running of the contractor firms. According to Hodgson and Gwagwa (2013:26), planning can be described as a series of actions that are designed to achieve the desired outcome. Hauptfleisch (2012:33) pointed out that without proper planning skills, a contractor will not be able to properly decide what needs to be done, by whom and when. Hauptfleisch (2012:33) lamented that the lack of proper planning effectively means that most electrification contractors are not being able to translate their visions and missions in a manner that leads to the achievement of goals and objectives of the electrification programme.

4.3.1.2 Inadequate Funding

Funding is an important aspect of successfully executing a project. Lack of funding affects so many things in the project plan. For instance, materials and other resources will get delayed if there is no funding.

> *…the challenge that we come across mostly when we hit the ground at execution phase is that most of our projects run short of funds along the way. This is a negating contributing factor to any project… (PC 5).*

Poor budgeting is part of the problem, which creates a shortage of funds as requirements sometimes increase in the course of implementation. This was illustrated in this way.

> *…when we plan a project we are actually limited due to insufficient funding because some of the projects cannot be completed due to the budget that was allocated to the project, we might find that there is more connection required at the time of execution so you need to go and request for additional funding. (PM 1)*

Another respondent states that late approval from the government regarding project funding also contributes to delayed implementation.

> *The late approval in the sign of electrification projects funding, by that I mean each financial year its own funding/budget which is based on the number of connections that are to be delivered for that financial year. Our financial year starts first of March every year. So, the first of April every year you find that we only get that approval or that signed letter to enable us to take our projects to our local investments meeting. You actually get it in May and you have already lost 2 months (PM 2).*

Mottair and George (2012) state in their findings that one of the main factors affecting a project manager's performance and project success is inadequate funding for electrification projects by government and local authorities (Mottiar and George, 2012:9). The financial challenges encountered by African electrification service providers are also mainly due to the low-profit margins that they get from the projects that they undertake due to the machinations of the open tender system which often results in the lowest bidder getting the award for the tender (Theron, 2013:47). This also added to the financial woes of electrification project providers in that they will be unable to adequately pay their workers market-related salaries, grow their operations or purchase the latest machinery. Due to the vagaries of both the African economy real demand for contractor services in the market is always fluctuating to such an extent that contractors may often go for months or even years without getting a tender to provide services (Malongane, 2012:35).

4.3.1.3 Poor Estimation of Projects

Management can cause delays before starting a project with a poor estimation of project costs. In situations where there is a poor estimation of budget, this slows down the planning process because if costing of a particular project changes, then it has to be rectified before the administration of the project. The difficulty of project estimation was depicted in this way:

> *…Some of the projects have a long duration that they are not estimated accurately. This affect costing of the project. Knowing the demands of customers in the chain, i.e. assuming we are doing 50,000 connection this year is not easy and our stores cannot provide materials for all these projects. Sometimes we do projects and we don't have meters, material demand that is being generated by our department is not met by stakeholders… (PC 3).*

Delays in formal processes to address discrepancies in project estimation takes time such that there is inadequate funding at the start of a project.

> *…Let say I have two packages to start off with maybe in April but I am looking at the Gazette now. What has been gazetted is a project gazetted at 5million. But when we cost a project, it needs 10 million. Instead of us starting, we need to do a change control. This takes time. But now we cannot start. What do we do, we do administration before we can start with the actual work so that is another delay. We end up not having sufficient fund to start a project…(PM 4)*

According to Dlungwana, Noyana and Oloo (2014:47), most contractors delay completion of electrification projects because of poor project pricing mechanism and poor financial forecasting. Dlungwana et al. (2014:47) observed that more often contracting firms lack the capacity to carry out a proper bill of quantities. Often, there is a lack of capacity by human resources to do a proper and accurate financial forecasting of project costs and revenues by incorporating statistical and scientific models of cost extrapolation, and estimation. This often works to the disadvantage of contractors as they often bid projects far below cost recovery or break-even levels. This has led to under-pricing of projects and incurring resultant losses.

4.3.1 4 Lack of Integration among the Role Players

Another major internal factor that contributes to delays in electrification projects is the lack of integration and clarity of roles by various stakeholders. Delays occur because some workers in the departments, which are stakeholders, are clueless of their expectations and how they best fit into the electrification project. One of the project coordinators expressed how poor integration and role awareness by stakeholders contribute to delays in electrification projects.

> *in terms of what is expected from stakeholders, there is no coordination amongst stakeholders- … in various department, expectations are different. Some stakeholders are not aware of the expectations to meet. When you start the programme other people are not even aware of what we are expected to do. So time to time, we need to push those people to say please do this because this is*

a priority. We are already running late and those people are not aware of. (PC 1).

Another participant reflected on how silo approach to work created delays due to lack of collaboration.

> *This is a management issue. In Eskom KZN, we are working in silos, not working as a team. Supporting departments are supposed to make sure they support the electrification department (PC 2).*

In particular, the failure of integration and collaborative working style between design and survey department was highlighted as critical in delaying electrification projects.

> *… Design department, survey department, but we do not seat together and full integration meeting and plan prior to the beginning of the financial year and plan as to how are we going to execute our project….. We do not plan, we do not check our designs, we do not have a meeting with our engineers and go through each and every design together to ascertain that the design is complete (PM 2).*

Another participant had this to say to reveal the lack of collaboration which caused delays.

> *Most of the time, there are issues whereby you've been given a project to execute but there is bush clearing and not specified, you only find out the issue when you are on ground during construction and you don't have a budget to cover that so you need to go back… which means the survey department or the supporting department that was supposed to support the survey didn't, survey was supposed to identify that (PC 2)*

4.3.1.5 Insufficient and Late arrival of Materials

Late arrival of materials is another major factor that causes delays. This is as a result of other factors like; awaiting of permits, inadequate cost, late appointment of engineers, high cost of transportation, insufficient trucks to deliver materials (some materials have to wait in line), poor estimation of projects (which delays planning for the right amount of materials to be delivered), and availability of materials in stores. Moreover, materials are reserved at a design stage and detailed design is passed, if it was discovered that materials were reserved but stores failed to order as per Eskom's reservation or stores don't have sufficient quantities as requested then materials will be delayed and in turn delay project completion. Participants reflected on delays in electrification project arising from the insufficient and late arrival of materials.

> *As Eskom, we supply the contractors with materials. So if we don't give them materials on time, it is going to delay the project. and it got effects on it because if they seat inside, they accumulate preliminary and general (P's and G's) all and it becomes out of hand, sometimes we run short of money because of the same factor that was not considered from the beginning (PC 1)*

Late completion of designs or failure to specify requirements in the design creates unforeseen challenges that require timely and emergent actions to correct the situation.

> *… in terms of design, they are late or there is something missing sometimes they don't specify… only you can find out when you are on the ground and see the problem. Thus, you have a problem but you don't have the budget to solve them. When they request outages, there are lead or time duration to get those outages. So if you don't follow the outage/due process on time, you won't get the outages when you need them or when you want to do outages (PC 2).*

In a different vein, participants underscored how issues of design affect delays in delivery of materials but also challenges regarding the availability of materials.

> *…Another execution challenge is the late arrival of the designs because they are waiting for permits, material shortage in terms of delivering by stores… (PM 3)*

While many participants focused on the availability of materials to complete a project, another participant focused on the lack of materials to actually start the project.

> *We have a challenge with our logistics department. Material delivery and material availability is a big challenge, you find that in some instances when we are sourcing materials to deliver, we find that the materials are unavailable even in the KZN-OU stores. It's a challenge because materials are critical aspects of the project delivery. If we don't have material there's absolutely nothing we can do to make sure that we meet the starting time. (PC 5)*

Another participant echoed how the lack of materials compounded delays in project execution.

> *…now you are ready to start, the stores don't have the material. Already you have been delayed. You were doing the administration of getting the monies approved. After you have appointed the contractor and now you want to buy, then there is a problem. In fact, already you have lost so much time during administration to get the funding and the scope that could be executed with the money that you have and then another stumbling block is the materials (PM 4)*

Project Manager 3 and some respondents continue by saying due to large amounts of projects that are allocated to Eskom, it makes it difficult to deliver all materials needed because there

is a shortage of trucks available and trucks available deliver according to who order first so this determines when materials will be delivered. Time is a factor as well if some of the activities have been delayed, it actually shortens the time scheduled for the project to be executed.

> *…due to Eskom's enormous project, there is delay in delivering of materials due to insufficient cost as some projects materials have to wait in line for theirs to be delivered or transport might be available but cost that is charged is too high in such a way that with the available budget we are not able to afford those costs… (PM 3).*

The lack of experienced human resources to present complete and timely designs was also a challenge contributing to delays in project execution.

> *… departments will complain about insufficient resources like customer services and NED have a problem with designers. Eskom does not use consultants anymore. They may have designers internally, but these are not experienced enough. They are just appointed like the newly appointed technicians who still need experience. They cannot perform at the same level as the engineers who have been in the game for a number of years… (PM 5)*

4.3.1.6 Incomplete Packages

Incomplete packages were also highlighted for hindering electrification as project contractors start to execute incomplete packages with problematic issues which halt progress.

> *… we get packages which are not complete for us to execute the project. When we are in the construction stage, we find that we cannot clear the trees, due to permits. There is no one in our managers who stands their ground to say we are not going to execute this package because it's not complete… (PC 3).*

> *… Another factor is our emerging contractors don't have resources that one is there when you go there they don't have enough resources like sometimes we expect them to buy materials, they don't have enough money to buy materials (PC 1)*

Supply chain management is seen as a concept that involves the sourcing of materials, transportation, storage and processing of acquired materials into desired products. Poor supply chain management contributes to losses by service providers like those involved in electrification projects given that uncoordinated and unsystematic purchases often lead to cost escalation and project losses. Dlungwana et al. (2014:47) lamented that most African service

providers do not incorporate best practices in inventory management such as calculating the Economic Order Quantity (EOQ) maximum and minimum re-order levels of inventory whose main purpose is to reduce inventory storage costs and losses. This unintentionally often leads to unsustainably high costs and reductions in profitability.

4.3.1.7 Unfair Allocation of Work

Uneven distribution of work amongst available human resources is another challenge. A situation where Eskom loses some employees in various departments which leaves a gap and stretches other resources in that department. The work of those employees will be left unattended to and this makes the remaining Eskom employees share the responsibility amongst themselves. This creates a sort of discomfort on other workers to take over the project that those employers left behind. This causes an overload of work and the employees do not have sufficient time to execute the additional work allocated to them. This also affects the quality of work produced at the end of the day.

> *There is overload, and some of these projects start late with the duration of 8-10 months. It's a failure anyway as you start a project knowing that you will not meet the deadline. …the allocation of work is unfair. I don't think it's fair and I don't think there is a clear procedure to be followed, like what is the minimum and maximum project a person can execute per financial year (PC 4).*

Clerk of works is overloaded to spend quality time on electrification projects while projects coordinators are also equally overloaded. However, there is unfairness in work allocation, which creates overload and delays projects.

> *… projects are visited but clerk of works are failing to spend quality time on them. The issue of resource shortage is key so it needs to be looked at as well to try and improve things. Project Coordinators (PCs) have got a lot of projects to manage, they need to know what is happening with each and every project… But some Project Coordinators have 1 or 2 while others have 8 projects; so that is unfair, it has to be well balanced… (PM 3)*

The scarcity of botanists in KZN meant that there was too much work for a few people to deal with timeously.

… That is the issue of permits for botanist, contracts and time taken waiting for the permit to be granted and the time for the botanist to do their work. The availability of botanist is also a big issue. There is two or three botanists in KZN, that is a problem. I mean if you look at the number of projects that are in KZN versus the number of botanists available, then you see a problem. Improving or reducing delays in electrification needs attention to this as well… (PC 3)

4.3.1.8 Failure to use project management principle

Participants reveal how Eskom was not using project management principles to reinforce contract rules and clauses. This is what one of the interviewees had to say about the failure to reinforce contracts and informal working relationships.

The main challenge we are faced is that Eskom is not working according to project management principles so that's the challenge … from a Project Coordinator level, we are not aware of what we are supposed to do. So we are not using the contract, we are just working, using a gentleman's agreement. It makes it difficult either for a contractor to apply some clauses to us or us to enforce some clauses to them. It becomes very informal so it causes delays because you are being personal if you are saying something that is right. (PC 1)

4.3.2 External challenges that cause delays in electrification projects

Project managers and coordinators uphold the view that the delays in the electrification projects were also due to external challenges. The results indicate that six themes reveal the various external challenges which include (1) political instability, (2) lack of experienced and competent contractors, (3) geographical conditions, (4) Government bureaucracy, (5) community frustrations and (6) conflict between project coordinator and contractor. Each theme is presented in detail below.

4.3.2.1 Political Instability

Political instability is a major challenge in project completion delays. Municipalities with different political interests cause an interruption in the completion of projects due to the fact that councilors will want to force their agenda on project coordinators and if their agenda is not accomplished or executed, they go into a conflict which disrupts on-going construction work

in the community. One participant echoed how fights among political parties created delays in the electrification project.

> *… because if we go out there, the expectation of the municipality sometimes is not the same because they expect us as Eskom to fulfil what they are expecting, so if there is fight amongst different political communities out here, sometimes the projects get delayed. (PC 1).*

Political differences create tension and division which impede the progress of rural electrification as illustrated below.

> *The municipalities are politically motivated (we get to the people through municipalities). That is a big hindrance for our projects because you will find that in a village, the councilor for that ward is from another party, the rest of the municipality is from another party, form the municipality, these people are not coming with one mandate to us. So we come in the middle of them, maybe the mayor is towing you to the other side, the councilor is towing you to the other side, the community wants electricity, they don't care who says what….. (PC 3).*

Changes to plans fueled by politically motivated interest also delay electrification projects.

> *…think the first contributing factor is poor planning, the planning of our projects is always politically motivated, we can plan for a project for the year to come but due to politics, things change…this delays us as Eskom (PM 5)*

Likewise, if there is political instability, this will lead to community unrest by fighting with project coordinators to complete construction their way and this bends the processes that have been put in place to complete the project

> *…sometimes the project does not cover all communities. The communities not covered in the project riot so that they can be part of the project. Sometimes the projects get stumbling blocks like these which are not identified prior to the start. These riots cause delays to the project (PC 2)*

4.3.2.2 Incompetency and overloading of contractors

Lack of experienced and competent contractors cause major delays on electrification projects. A contractor who is incompetent and is not aware of his/her expectations on a

project will fail to deliver and not meet up with the required time budgeted for project completion. One of the participants echoed how poor selection of contractors, mismatch of contractor experience and magnitude of the project were not only critical in delaying the electrification project, but also killing the new contractor`s prospects of success.

> *If contractors have been put in place, do we have enough contractors for the project, experienced contractors not just contractors? We need to understand that when you appoint contractors, we need to consider experience. When we talk about engineers, you cannot take a project of R20million as an example and appoint a new contractor in business that has never done electrification project. By so doing you are not only creating delays in a project but your also killing contractor prospects in business… (PM3).*

Incompetent contractors do not only fail to accomplish projects but also delay the electrification project as there are legal processes to be followed to take them out of site but also appoint another contractor. The implications and procedural delays of dealing with an incompetent contractor were illustrated in this way:

> *…When you allocate projects to contractors are we balancing according to experience, we look at resources, projects running costs, contractors experience versus the work that needs to be done. We have seen in the past contractors pulling out of site because they are failing to deliver because financially they are not fit and it takes time to appoint another contractor after you have pulled a contractor out of site. To take out a contractor from the site, a legal process must be followed. For instance notification to a contractor to vacate the site and to appoint a new contractor. This process might take 3 months which causes delays on its own. This can take three months and the clock is ticking, the project is not moving come 31 March the project must be finished… (PM 3)*

It was also revealed that projects were not evenly allocated among contractors to the extent that some contractors were overloaded with many projects, leading to failure to meet project requirements and finishing at the specified time. Overwhelming contractors with many projects and its effect on project delays was illustrated in this way:

> *"Likewise, some contractors don't give maximum work output in the course of managing and monitoring of projects, most of the overwhelmed contractors pay less attention to details and leave some projects unattended to, in the end, the contractor will fail to meet deadlines which add up to delaying project completion"(PM3).*

Contractors with many projects tend to be overloaded, unable to finish projects on time.

> *…some resources are overloaded, some of those projects like you can't manage too many projects, there must be a fair allocation of projects especially internal resources to the contractors, some contractors pull many projects and don't have enough resources to complete all. (PM 4).*

Cooper (2013:27) investigated the causes of delay in order to examine the challenges facing rural electrification services. Major findings were managerial incompetence, poor financial and inventory management, high staff turnover and poor employee remuneration. The reasons for the failure to attract and retain experienced, qualified, and skilled employees are numerous. At times, public sector institutions like Eskom takes too long to pay contractors due to complicated and lengthy procedures such that these rural electrification service providers often experience cash liquidity challenges which in turn leads to failure to pay employees on time (Banks, Willemse and Willemse, 2011:7).

4.3.2.3 Geographical Conditions

The topography of the location and weather conditions add to the success of project completion. Sometimes, project coordinators realise that there needs to be bush clearing and other things done for easy execution and in other circumstances, execution gets interrupted by the weather, the contractor has to stop the project and continue when the weather condition is good. One of the participants had this to say regarding how topography affects the delivery of electrification projects.

> *…the terrain of the project, we can have a rocky terrain of which we need blasting or bush clearing. However, those two elements are never catered for so if we don't have enough funds we will have to do whatever that is possible within the particular budget that has been given… (PC 3)*

One important condition commonly cited in the literature for the successful development of rural electrification projects is the need for good coordination among different institutions dealing with electrification issues. This represents a fundamental pre-requisite in order to guarantee that everyone has potential access to electricity (Haanyika, 2006; Urmee et al., 2009). Lack of coordination as well as unclear financing mechanisms can cause the failure of the project and may prevent shares of the population to have direct access to the electricity source. For example, in Ethiopia, government policy stresses the significant role of rural electrification

in improving the quality of life in rural areas but, at the same time, the electrification process is left to the electric utility company without an appropriate budget provision from the government (Mariam, 1992). In the case of South Africa's electrification programme, the policy of providing electricity specifically to rural households has not been successful for reasons related to the availability of subsidies. In 2008, Eskom, the national power provider, launched a programme to subsidize solar water heating, but the subsidy level was too low, not clearly organized, required massive administration and control systems, and the programme has had little success. The implementation of renewable energy has been slow and the share of renewable energy in power supply is still insignificant (Niez, 2010).

4.3.2.4 Government Bureaucracy

The practice of bureaucracy by the government hinders the success of a lot of projects. Some processes employed by the government in approving funds are unnecessary because they are formalities that take a longer time to get funding approval for a project.

> *…from our side government policies is also a constraint i.e. you will see a project that needs approval but it's taking longer to get approval and carrying cost (PC 4)*
>
> *As a business in Eskom. We have a lot of governance processes that are unnecessary, we have the investment committee, task order committee, procurement committee, all these gatekeepers that you need to go through before you can start any execution…They also contribute to delays in electrification projects (PM 2)*

4.3.2.5 Community Frustrations

There is always an agreement between the project coordinator and the councilors of communities on timeframes and how the project will be executed. If project coordinators don't meet up with the plan, it causes frustrations to municipality leaders and paints them as incompetent by the community of not executing the plan as stated from the beginning.

In some instances, the community wants to dictate how the project should be implemented which is often not according to the plan.

> *Another delay is the communities, they also have an impact on our projects, they just don't want us to execute our projects the way we see it fit, they want*

us to execute our projects the way they want it, and because we want to maintain the working relationship with the community and it's because we are in their space so we need to sort of give them the lead way how you would have wanted it to be done. And sometimes we find that when they want to bend our processes, then it becomes a problem. For example one of our projects that we were doing and a community want to do their own things so… (PM 4)

4.3.2.6 Conflict between project coordinator and contractor

Where humans are involved there will be a clash of interest, this might occur during project execution where employees (project managers, project coordinators and contractors) cannot reach a conclusion on a project based on conflict of ideas and in turn, this delays project completion.

there could be a clash of interests between leaders and contractors whereby not meeting up with targets…all the team leaders don't want to see things from our point of view when you come up with genuine reasons for not meeting up with targets, then you find that they want their targets despite of those challenges we face… (PM 4)

4.4 Strategies that could be adopted to reduce project delays at Eskom Electrification Department KZN-OU

A variety of five themes were identified to reflect strategies which can be adopted by Eskom to reduce delays in rural electrification. These themes include (1) *"Clear separation of tasks and activities into Phases*," (2) *"Setting realistic targets*," (3)"*Working together/Teamwork*," (4) "*Integration of Departmental Goals*," and (5) "*Proper Alignment of Eskom Processes and adequate Resources*". Each of the strategies is presented below.

4.4.1 Clear separation of tasks and activities into Phases

Project managers and coordinators asserted that another strategy to reduce delays in electrification projects is by a careful and clear separation of activities and tasks into phases. One of the participants echoed how all project activities must be separated into phases with clearly defined principles regarding how the project will be executed.

> *… so if Eskom can say on a project, they make sure that they separate all these activities, let say into 3 phases/ elements say on excavation, they employ a sub-contractor, on LV they appoint another sub-contractor, then on MV they appoint a sub-contractor and then all these activities will go parallel so if the project is supposed to take 6 months, a project can take 3 months (PM 3).*

The construction industry has to implement new ways of working to be competitive to meet the demands of the clients. Working in collaboration is essential for the design and construction teams during the complete lifecycle of the project. Also, it is now recognized that good collaboration does not result from the implementation of information technology solutions alone, the organizational and people issues, which are not readily solved by pure technical systems, need also to be resolved (Shelbourn et al., 2007). The collaboration between individuals related to different fields is a more difficult task and it does not happen by implementing techno-solutions. The main issue emerging from this analysis is that the softer issues need more attention than the issues related to technology to ensure that the plan and implementation of collaborative working are more effective in projects.

4.4.2 Setting realistic targets

Setting of realistic targets could be a better strategy in order to properly manage allocated projects within the specified time frame. One of the participants echoed how this would entail the reduction of targets as illustrated below.

> *I think we need to find ways and means to reduce our targets. We can try and negotiate that our targets can be reduced so that we can properly manage our projects or maybe if they can find ways and means to try and eliminate the delays in the delivery of materials. If senior management can seat and discuss to find a solution to the design challenges, if we can eliminate those internal challenges and constraints when it comes to the delivery of our targets, then it won't be a problem. If we can have the ball rolling smoothly from the initiation phase up until the execution phase, this can reduce delays (PC 5).*

4.4.3 Working together/Teamwork

Participants proposed that all relevant departments that are fully in support of the goals of electrification department must be integrated in such a way that all activities and expectations

are clearly stated which will promote team building and allow for division of labour amongst workers in Eskom. This is what one of the project coordinators had to say about the need for teamwork.

> *We need to work together as a team and if we are to design or anything that needs to move to the next stage, we need to do it early as a team (PC 2).*

Another reflected the consequences of poor teamwork within Eskom but also confusion with municipalities.

> *In electrification department, we have got execution and planning. As execution, we are dependent on planning department a lot. Even those two bodies, they need to sit down and speak one language because you find that the planning department presents their plan from the municipality and say here is our delay for this year, but you find that when the mayor of a certain municipality may put it a new project when there is community unrest in the area. The mayor won't go via planning department, they will go via asset creation manager, now asset creation manager will now go to planning, so things are not going on a right track… (PC 3).*

Teamwork also entails having a similar sense of urgency and understanding the significance of cooperation and efficiency.

> *…Supporting departments must understand the same urgency that we have to know the timelines we are dealing with. The more resources that are allocated, the more cooperation this will need. Better efficiency in delivering the projects and the financial aspect is key… (PM 1)*

The alignment of KPI to the day-to-day work of employees is needed if they are to pay attention to electrification projects.

> *The issue of saying electrification is not my problem is not good, we need to work together, If you have got a role to play in the chain then you are part of the program whether you like it or not. Hence, you need to look at the KPI's the way they are done. If KPI does not require them to performance in electrification then this is the problem. There is a need to align KPI with day-to-day work.…(PM 3)*

Team building is another important strategy, employees must work together during project planning and execution and not overloading other employees and leaving the bulk of work to some employees to execute. It is the responsibility of all units at Eskom to build a good team

in executing projects, especially other relevant departments must endeavor to support electrification departments at the execution stage not only at the planning phase.

4.4.4 Integration of Departmental Goals

Electrification occurs only if different departments have worked together. However, different departments have different priorities, which does not embrace electrification. One of the participants was explicit that the integration of departmental goals to reinforce electrification was a key strategy to reduce project delays.

> *…my strategy would be to integrate all departments to have one common goal and understand the primary/objective of all integrated department and what we need to achieve as a department, what is and not the priority. What must we first before we can do other stuff … (PM 5).*

Another respondent suggested that the strategy to reduce delays in electrification projects must also focus on sensitizing all Eskom employees about the timely completion of electrification projects as a priority.

> *Also another department cannot rescue you from your problems, other departments are not in a hurry, so it shows no one has sensitized them about the importance of completing a project on time, because once you sensitize people, 50% of them will buy the idea, since no one is sensitizing them they will tell you they are busy with their line patrol, at the engineering level, they say they are busy with other designs …..(PM 5)*

4.4.5 Proper Alignment of Eskom Processes and adequate Resources

Participants stated that proper alignment of Eskom processes and adequate resources was a key strategy to reduce delays in electrification projects. This would allow for easy identification of shortfalls and what must be done to avert issues and close gaps.

> *…and other thing you need to underline is the issue of governance at Eskom is very important we cannot bypass Eskom governance process we have to make sure we do things in line with Eskom process hence certain things have to wait if something has not happened to make sure you comply with the process… (PM 3)*

> *…I feel Eskom processes are not properly managed/aligned for instance the process is not clear to everyone and the process is not visible to everyone, meaning some of our projects are seating within the project. There is no one who sees that those projects are not moving. However, if the project was clear to everyone, then everyone would see why a certain project is active and proactive… (PC 4)*
>
> *..At the beginning of the financial year, we must seat down. Its either managers can seat with each individual but the priority must be the same and achieved. There should be a proper structure of processes. Storage issues as well, the store should procure materials on time and then orders should be sent beforehand so that stores know what is required… (PM 5)*

In terms of financial resources, participants were of the view that an accurate process of requesting funds based on what was gazetted rather than what is needed would be helpful.

> *…So let's not be driven by the number but by the reality of what does OU have. If we gazette what we have at hand, the money that we will request from the department of energy will be more accurate. You have got a design, then you price the design that you have, then you put it there. Let's gazette on what we have and not on what we need to give… (PM 4.*

Flexibility in the use of resources in the interest of rural electrification by Eskom would also help in reducing bureaucracy as suggested below:

> *So if we have money clogged in one municipality, I think it's fair to get help from another municipality. This would be quick without going all the way to the administration saying that the other municipality allowed me to use their money on certain projects because our designs were not enough. Why must we give the municipality the power to say you must first come to me for any changes (PM 5)*

Adequate resources also relate to human resources necessary to execute projects and those resources must be competent and experienced.

> *We need to have adequate resources for any project to be successful, and not limit them but to have adequate resources that are required and follow due processes and also the delivery time, if there is additional service that is required… (PM 1)*

As part of ensuring the adequacy of human resources, participants suggested the need for a system to check skills availability within Eskom.

> *…we need to have a system of checking the available skills within Eskom, who has got what training, experience, where has worked before and check in those departments whether those people really need all the people working in that department. If we feel that out of 10 people in that department we can survive with 5 people, let's move the remaining 5 people with experience and qualification to where they are required that to me is an exercise that needs to be done to ensure we have adequate skills in key areas…(PM 3)*

It is important to make sure all resources are provided, sometimes due to the number of projects Eskom executes, it becomes overwhelming, in this case, reducing of targets per year would help in managing the projects that are delayed and carried over to the following year. It should be mandated that all materials to be used in a project must be ordered in time to avoid delays on site.

4.5 Respondents' Recommendations on Project Completion Plans at Eskom Electrification Department KZN-OU

The different views of project managers/coordinators regarding recommendations to reduce delays in electrification projects were categorized into four key themes. These themes include the (1) prioritization of projects according to size, cost and importance; (2) fair allocation of work to avoid overloading of contractors; (3) well-planned strategy which emphasizes on the accuracy of estimation of project cost and adequate resources; and (4) penalty to incompetent contractors. Each of these findings is presented and discussed below.

4.5.1 Prioritization of project according to size, cost and importance

Participants stated that projects must be categorized into sizes, cost implication and importance/priority, this would allow for proper planning and appointment of competent contractors to execute them.

> *…We need to prioritize projects based on sizes, based on their cost, also based on their importance i.e. if there is one big project and know it is going to take 10 months to complete, let us have those project of importance first because we need to start them immediately. If we miss them by 3 months it is gone, so starting on time is very important… (PC 4).*

Another participant echoed how the appointment of contractors needs to be aligned to the size of the project as shown below.

…how we appoint contractors need to look at the competency level of contractors to execute the size of the project. When we have got different sizes of projects like medium, big projects, so we need to categorize and appoint contractors as per their project size… (PC 5).

Prioritization of project activities is pivotal to allow proper planning by each department involved in electrification.

In the department, we need to categorize activities, set priorities and see which one are important. This is key so that all activities are planned properly; it's not going to be each department planning their activities only whereas other departments are also expecting their work to be done. That's where we are losing it… (PC 1)

4.5.2 Fair allocation of work to employees and avoid overloading of contractors

Projects must be fairly allocated amongst employees and understand the capacity of each employee based on the level of experience and coordinating skills.

we need to know in terms of project allocation of resources, how many projects a person can do successfully without getting pressure or sick. We should not overwork some employees because that's where issues start. When a person is being overworked or cannot be able to manage projects at the same time, then that's the problem. We should have a fair allocation of projects to each employee… (PC 4)

There is a need to understand employee performance better in the context of electrification projects to help those experiencing difficulties.

…We should also go back in reviewing what is the issue of not finishing project on time per individual so that if there is a gap in terms of competence that is needed, a person can be trained, or advised of the way they should conduct themselves of some of the activities because some of the projects are failing because people don't know what to do or when to do it. So we need a proper structure in terms of evaluating gaps in the development of an individual… (PC 5)

This is what one had to say regarding the overloading of contractors.

Some contractors are overloaded to do things properly and timely. They have many projects….lack resources to manage. This need to change.

4.5.3 Well planned strategy which emphasizes on the accuracy of estimation of project cost, adequate resources and risk identification

Participants were explicit that a strategy on how to achieve results according to stipulated time needs to embrace a variety of key components such as the accuracy of estimation of project costs and adequacy of resources. Planning ahead and cultivating the habit of adhering strictly to the plan that would help in achieving successful completion of projects. One participant was clear that there is a need for a clear plan and planning process to avoid being requested to entertain a project in the middle of the year.

> *There is a need for managers who can stand their grounds saying no this year we won't be able to help you.Our plan has been presented and it stays like. We will help you the following year. When it's time to introduce or to submit their IDPs, Municipalities know they need to submit their IDPs. I wonder why they do not plan properly on their side that they leave their electrification projects. In the middle of the year, they want their project to be entertained then it will change the whole picture of the plan… (PC 3).*

As part of a robust strategy, realistic cost estimates and thorough steps are key to avoiding delays and problems in electrification projects.

> *Starting from initiation phase, we need to make sure (sometimes we run short of money) that our planning department at least they use the current rates when estimating the cost of each project so that we at least have more than what we require than to have less than what we might require to execute a project. All designs, they need to be scrutinized, someone has to check maybe a senior in our design department, design should be given much attention all documentation should be in order, all documentation should form part of the package or it can be handed over to execution because an engineer still owns a design up until the end of the project so whatever challenge you should come across, you should not face challenges at the execution phase (PC 5)*

The estimation for any project is the key to profitability and the growth of the company. Accurate estimates will help in realizing the outputs with the proper allocation of resources that are required for the project. Thus, the estimate for any project has to be accurate to the last detail to ensure competitiveness in the market. The ability to accurately forecasting the cost of delivering a project is the key to a cost-based competition. The literature on cost estimation has focused on specific estimation methods as broad techniques and not much consideration has been given to the distinct requirement of each project. Drawing from organization control theory and cost estimating literature, this note develops a theoretical framework that identifies

the critical factors for effective cost estimation during each project phase of a conventional construction project (Liu et al., 2007). The main logic is that with the progress of a cost estimate, the programming of the activities and the output measurement can be done in a better manner and the result will be that input oriented control will shift to output control.

Another aspect of the strategy which relates to the adequacy of resources was suggested in this way.

> *…during the time designs are done, we need to make sure that we order materials in time, right quantities are ordered as per design packages or the department that deals with materials not sure if its project services or not, but with the request coming from the project coordinators, which means project coordinators need to engage the engineers to get what is required per designs, and they place orders in time because material got long lead which means there are materials that you cannot get in a week or two, you have to wait for 3 or 6 months, things like transformers, poles, etc. those things need to be ordered in time if we don't order materials in time you will have a problem come April… (PM 3).*

Another participant had this to say about the need for adequate resources and proper use of time as a resource aligned to specific project activities.

> *To finish projects on the plan, get resources, start on time by obviously preparing previously the financial year to ensure all these packages have been completed and approved and contractors are sourced just before the financial year is completed. This needs to be before the new year so that we don't wait for timelines of TOC where we actually have to wait for contractors to be selected (PM 1)*
>
> *… also the issue of the departments e.g dwarf, MAFA, Ezemvelo management needs to have a timeframe of looking at permit requests, time taken for approval and water use licence department for example-for instance we have got two projects in Newcastle namely Mankandane and Mkhumbanewe have been waiting for 2 years to get approval which is a problem, if the projects have been designed and the pegs and there is everything … (PM 3)*

Project manager 3 discussed extensively on having a summary of the project life cycle to give everyone involved a holistic picture and implications of individuals not doing their roles.

> *I think to improve on the way forward, someone needs to map the whole process, or summarize the whole project life cycle from planning right up until to the*

stage where the project is closed. We identify each and every department, what are their role, identify specific people who are in charge of every section, put timelines for each and every activity that needs to be done. You clear that activity, then you put everyone in one boardroom so that you talk through this map. We get someone who is experienced to get everything and make sure that each and every individual understand his/her role, and understand the impact it has got in case the person doesn't do what he/she is expected to do. If one person doesn't do his part, it affects the whole project chain because that is what we are lacking in electrification. Yes, we have explained the map but there are people who don't understand… (PM 3)

Similarly, project manager 4 emphasized on the need for project reviews.

…We need to drive project review meetings involving all the relevant departments who play these roles in electrification so that on a monthly basis, you can track the progress and identify problems. The meeting has to be driven at a portfolio level or even at an asset manager creation level where every single department is brought together to know the state of the project., Even if it's done on a quarterly basis on asset creation manager level, at a portfolio managers level that must be done monthly… (PM 4)

Project review is very important as it would allow Eskom to keep track of what is happening. It was recommended that an integrated stakeholders meeting must be held to make sure that all priorities are well understood, and everyone involved in the project is sensitized about their expectations. However, during the project close off meeting, the project coordinator must involve all the role players to review the project if everything that was done went according to plan and if otherwise was the case, there needs to be a question of why the project wasn't completed and the meeting must be able to provide reasons and recommendations so as to eliminate such mistakes in the future.

Risk identification was highlighted as another critical aspect of reducing delays in electrification projects. One of the participants emphasized the need to identify risks upfront at any stage of the project.

In terms of the survey, all risks need to be identified up front so we can be able to mitigate them up front, not leave those risks when the risks are not highlighted they become a problem. (PC 2)

…we need a proactive system to handle bigger projects that are not moving so if you need management assistance or any assistance we will be able to track that project is giving us problems let's put in some more efforts in terms of

> *channeling it forward… we need the memos to be done correctly so that there will be no delays in terms of executing and then also finalizing the project. (PC 4)*

For every project, whether it is a mega project or a small sized project, the identification of all the risks for that project is essential in initial stages. This will help in developing action plans to meet those risks and to make all the stakeholders aware of their effects if not attended to at the initial stages itself. A realistic procedure is recommended to work out the size of the program for a project or a budget for an unforeseen risk at any stage of the project. The size of the budget is a function of the number of risks expected at the specified confidence level. The number of risks used for developing the contingency budget depends on the total number of risks to be considered and the estimated probabilities of occurrence of the risks (Khamooshi et al., 2009).

The risks that are determined will also indicate whether impact may be major or marginal and the budget to be allocated accordingly. When the risks for a specific project are more than 20 or the exact number of risk that is calculated by a binomial distribution will be tabulated to indicate the exact number of risks. The findings indicate that a certain amount of budget should be allocated for small risks in a project which in any case would materialize. The exact number of risks would depend on the acceptance of the risk by the company. The risks that have to be identified and analyzed for any project from the list of probable risks is a problem where the decision lies with a multi-group regarding where to attribute the risk which is a problem. Conventional approaches to risk identification and risk analysis separately tend to be less effective in dealing with the imprecise of the risk analysis individually. (Mojtahedi et al., 2008).

4.5.4 Penalty for Incompetent Contractors

Some respondents are of the opinion that any contractor found inefficient and not committed should be penalized as this would serve as a lesson to subsequent contractors.

> *The poor performing contractor to be penalized because I can tell you if contractors can be penalized for not adhering to the approved construction plans. And they are costing us time and money at the end of the day… (PM 2)*

The projects completed on time or otherwise are a source of valuable information for the people who would undertake a similar project. The information would be a transfer of knowledge for the benefit of those who otherwise would encounter problems similar to those encountered by

the earlier counterparts. Also, people who have encountered situations which needs to be known, so that others can take benefit from it can be done by performing training in such specific issues and matters. In projects, the decisions made by the site personnel are important to the success and failure of the project. The decisions made on the field by the team dictates whether the profit margins are gained or lost hence the knowledge of planning and scheduling should be integrated at the field level. Profit margins are gained or lost by the field decisions, so the knowledge of planning, scheduling and managing project cost should be integrated into the field at all levels of supervision (Koch, 2008).

Eskom must endeavor to appoint contractors who are competent to execute the job but notwithstanding the Black Economic Empowerment (BEE) has been a major setback where employers are unable to employ those who are rightly qualified based on paper and human experience.

> *To ensure that competent engineers are selected and appointed to design the electrification projects because what I have seen is that most of the engineers that are designing our projects, they don't know what they are doing, they just doing a copy and paste, so competent engineers are to be appointed… Competent contractors to be allocated to complex projects, the more the difficult the project, you select a competent and experienced contractor for that project and the less competent contractor to be allocated within fields. For me, a competent contractor is not all about qualification, an experienced engineer who will be able to design without any faults… (PM 2)*

> *…Also hiring all the contractors that need to be on site, also we shouldn't focus unto one department, we fail to look at our requirements before connections, like what are the things that must be in place, so if we can strike a balance on that… (PM 4)*

4.6 Summary

This study has revealed that there is a variety of internal and external challenges which affect the delays in the completion of electrification projects in Kwazulu Natal-OU. In this study, six themes have depicted the internal challenges which cause delays in electrification projects in Kwazulu-Natal. These include (1) poor management and planning process; (2) inadequate funding; (3) poor estimation of projects; (4) Insufficient and Late arrival of Materials; (5) Incomplete Packages (6) Unfair Allocation of Work and (7) failure to use project management principles. Project managers and coordinators uphold the view that the delays in the electrification projects were also due to external challenges.

However, the internal challenges do not give a complete picture as there are also external factors which contribute to delays in the completion of electrification projects in KwaZulu Natal. The results indicate that six themes which reveal the various external challenges include (1) political instability, (2) lack of experienced and competent contractors, (3) geographical conditions, (4) Government bureaucracy, (5) community frustrations and (6) conflict between the project coordinators and contractors.

A variety of five themes were identified to reflect strategies which can be adopted by Eskom to reduce delays in rural electrification. These strategies include: *clear separation of tasks and activities into phases*, s*etting realistic targets*, *working together/teamwork*, i*ntegration of Departmental goals*, and (5) p*roper alignment of Eskom processes and adequacy of resources*.

Furthermore, project managers/coordinators have suggested recommendations, which can reduce delays in electrification projects. These are categorized into four key themes. These themes include the (1) prioritization of projects according to size, cost and importance; (2) fair allocation of work to avoid overloading of contractors; (3) well-planned strategy which emphasizes on the accuracy of estimation of project cost and adequate resources; and (4) penalty to incompetent contractors. The next chapter focuses on the conclusion and recommendation from this study.

CHAPTER FIVE

SUMMARY OF FINDINGS, RECOMMENDATIONS AND CONCLUSIONS

5.1 Introduction

This chapter presents the summary, conclusion and recommendations of the study on the delay in the completion of electrification projects at Eskom Electrification department Kwazulu-Natal operating unit (KZN-OU). It focuses on the general review of the research process from background to the study, to data analysis and interpretation of results. It encompasses the summary of the whole research work in a brief and concise manner and provides conclusions based on the interpretations of the research findings. Also, it provides some relevant recommendations which can be very useful to Eskom to improve delays of project completion, and thereafter, it gives further recommendations which can be looked into by stakeholders, researchers, Non-governmental Organizations (NGOs), and government agencies.

5.2 Summary of Findings

This is a qualitative study to explore challenges which contribute to the delays in the completion of electrification projects in KwaZulu-Natal. This study used purposive sampling to collect data from a sample that includes project managers/coordinators regarding three issues related to delays in electrification projects- challenges, strategies and recommendations. Data collected through semi-structured interviews were analysed used thematic data analysis. The results reveal internal and external dimension of challenges which contribute to the delays in the completion of electrification projects in KwaZulu-Natal.

Firstly, results are detailed in six themes which depicted the internal challenges which cause delays in electrification projects in Kwazulu-Natal. These include:

1. Poor management and planning process
2. Inadequate funding
3. Poor estimation of projects
4. Insufficient and Late arrival of Materials
5. Incomplete Packages
6. Unfair Allocation of Work

7. Failure to use project management principles.

Project managers and coordinators uphold the view that the delays in the electrification projects were also due to external challenges. However, the internal challenges do not give a complete picture as there are also external factors which contribute to delays in the completion of electrification projects in KwaZulu Natal. Secondly, results indicate that six themes which reveal the variety of external challenges include:

1. Political instability
2. Lack of experienced and competent contractors,
3. Geographical conditions,
4. Government bureaucracy,
5. Community frustrations
6. Conflict between project coordinators and contractors. It is also noteworthy that project managers and coordinators at Eskom electrification department KZN-OU.

Thirdly, project managers/coordinators have identified five strategies which can be adopted by Eskom to reduce delays in rural electrification. These strategies include: clear separation of tasks and activities into phases, setting realistic targets, working together/teamwork, integration of departmental goals, and proper alignment of Eskom processes and adequacy of resources.

Lastly, project managers/coordinators have also provided a variety of recommendations, which can reduce delays in electrification projects. These recommendations relate to prioritization of projects according to size, cost and importance; fair allocation of work to avoid overloading of contractors; a well-planned strategy which emphasizes on the accuracy of estimation of project cost and adequate resources; and penalty to incompetent contractors.

5.3 Limitations of the Study

There are three limitations to this study. First, there is the limitation arising from the use of qualitative data only. Other sources of data such as project meeting minutes have not been used to shed more light on the challenges which cause delays in the completion of electrification

projects. Second, the challenges of electrification projection, strategies and recommendation regarding electrification projects reported in this study are based only on the views of project managers and coordinators. Views of other key stakeholders such as contractors and communities where the electrification projects are done are excluded. Lastly, the findings are drawn from a particular context of KZN such that they cannot be generalized to the whole of Eskom in South Africa.

5.4 Recommendations

The following are the recommendations of the study

- Eskom should have a project review which involves an integration of all stakeholders. This would allow Eskom to keep track of what is happening, to make sure that all stakeholders are properly sensitized and priorities are clearly understood.
- A well-planned strategy should be put in place on how to achieve results within the stipulated time. The strategy needs to embrace a variety of issues (e.g. accurate estimation, prioritization of project activities, the workload of contractors, adequate of resources) and map out the processes to all relevant departments and stakeholders that clearly state what must be done from the initial stage to the execution stage. This would allow for easy identification of shortfalls in order to avert issues and close the gaps on time.
- Separation of project activities into phases and these phases should be clearly defined with principles regarding how the project will be executed. Also, projects must be categorized into sizes, cost implication and importance, this would allow for proper planning and appointment of competent contractors to execute them.
- Eskom must endeavor to appoint contractors who are competent to execute the job. Projects must be fairly allocated amongst employees and understand the capacity of each employee based on the level of experience and coordinating skills. It was also suggested that any contractor found inefficient and not committed should be penalized as this would serve as a motivation to subsequent contractors.

5.5 Recommendations for Further Research

The following are suggestions for future research.

- There is a need for future research to include views of other key stakeholders such as municipalities and other departments within Eskom to enrich our understanding of challenges which cause delays in the completion of electrification projects. While the views of programme managers and coordinators are key, they fail to provide a picture of the challenges from the viewpoint of the municipalities and communities. Including views of different actors is key and should be complemented with the use of different sources of data such as project documents to enrich our understanding of delays in electrification projects.
- A longitudinal study can be adapted to focus on different stakeholders (government, contractors, and suppliers) involved with project planning and execution to have a comprehensive understanding about the nature of delays of electrification projects over a period of time.

5.6 Conclusion of the Study

This qualitative study has focused on the views of project managers and coordinators at KZN to explore challenges, which contribute to delays in the completion of electrification projects. In addition to the exploration of challenges, the study has also identified strategies which are key in reducing the delays in the completion of electrification projects. Project managers and coordinators have proposed a variety of recommendations to reduce delays in the completion of electrification projects. Additionally, areas for future research have also been highlighted in this thesis.

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RE: Letter requesting consent to conduct research
Reggie Dlamini
Sent: 08 August 2018 02:30 PM
To: Mandla Mntambo
Good Day Mandla

Your request is supported. No Eskom or contractor confidential information will be allowed to be released except the general information that pertain to the challenges affecting the delivery of electrification projects.

Best Regards

Xolani "Reggie" Dlamini
Electrification Planning Manager: KZN OU
No 1 Langford Road, Westville, 3629
Telephone: 031 279 6429
Cellphone: 083 4306 217

[redacted]

08/08/2018

UNIVERSITY OF KWAZULYU-NATAL
GRADUATE SCHOOL OF BUSINESS AND LEADERSHIP
COLLEGE OF LAW AND MANAGEMENT STUDIES

INFORMED CONSENT

Dear Respondent,

I, Mntambo Patrick Mandlenkosi (215075868), a master Student in Commerce Leadership Studies Westville Campus hereby invite you to participate in a research project entitled: *Delays in Completion of Electrification Projects in KwaZulu-Natal Operating Unit (KZN-OU).* The aim of this research is to explore the factors that cause delays in electrical projects at Eskom, KwaZulu-Natal province. It will investigate how these problems can be minimized and provide recommendations for improvements to the current processes.

Through your participation, I hope to identify factors that contribute to delays in completion of electrical projects, to explore the challenges faced by projects managers and coordinators in completing electrification projects and to examine the impact of delays in project completion on the lives of people in KZN OU.

Your participation is voluntary and there is no penalty if you do not participate in the study. Please sign on the dotted line to show that you have read and understood the contents of this letter. The interview will take approximately 45minutes to an hour to complete. I hope you will take the time to participate.

Yours Sincerely

RESEARCHER

Mr Mntambo Patrick Mandlenkosi
Masters in Commerce Leadership Studies
mntambpm@eskom.co.za
Cell: + 27 82 353 5635

SUPERVISOR

Dr. M. Mcdonald
kanyangalem@ukzn.ac.za

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HSSREC RESEARCH OFFICE

Prem Mohun

HSS Research Office

Govan Bheki Building

Westville Campus

Contact: 0312604557

Email: mohunp@ukzn.ac.za

DECLARATION OF CONSENT

I _____ hereby confirm that I have read and understand the contents of this letter and the nature of the research project has been clearly defined prior to participating in this research project. I understand that I am at liberty to withdraw from the project at any time should I so desire.

I hereby consent/do not consent to record the interview.

Participant's Signature _____

Date _____

Thank you for consenting to take part in this study.

Interview Questions

- To identify factors that contributes to delays in completion of electrification projects at Eskom electrification department KZN-OU.
    - What factors contribute to the delays in completion of electrification projects in KwaZulu-Natal Operating Unit (KZN-OU)?
    - What internal and external factors cause delays in completion of electrification projects at Eskom Electrification department KZN-OU?

- To explore the challenges faced by projects managers and coordinators in completing electrification projects at Eskom electrification department KZN-OU.
    - At the level of project managers/coordinators, what challenges are faced by delays in project completion at Eskom electrification department KZN-OU?

- To ascertain the strategies which may be adopted to reduce delays in completion of electrification projects at Eskom electrification department KZN-OU.
    - What strategies could be adopted by Eskom electrification department KZN-OU to reduce delays in project completion?

- To make recommendations on how Eskom electrification department may complete projects on schedule and according to plan in KZN-OU.
    - What can be recommended to Eskom electrification department KZN-OU to complete projects on plan?

UNIVERSITY OF KWAZULU-NATAL
INYUVESI YAKWAZULU-NATALI

31 October 2018

Mr Patrick Mandlenkosi Mntambo (215075868)
Graduate School of Business & Leadership
Westville Campus

Dear Mr Mntambo,

Protocol reference number: HSS/1830/018M
Project title: An exploratory study of factors delaying the completion of Electrification Projects in KwaZulu-Natal Operating Unit (KZN-OU)

Approval Notification – Expedited Application

In response to your application received 09 October 2018, the Humanities & Social Sciences Research Ethics Committee has considered the abovementioned application and the protocol has been granted **FULL APPROVAL.**

Any alteration/s to the approved research protocol i.e. Questionnaire/Interview Schedule, Informed Consent Form, Title of the Project, Location of the Study, Research Approach and Methods must be reviewed and approved through the amendment /modification prior to its implementation. In case you have further queries, please quote the above reference number.

PLEASE NOTE: Research data should be securely stored in the discipline/department for a period of 5 years.

The ethical clearance certificate is only valid for a period of 3 years from the date of issue. Thereafter Recertification must be applied for on an annual basis.

I take this opportunity of wishing you everything of the best with your study.

Yours faithfully

[redacted]
.....
Professor Shenuka Singh (Chair)

/ms

Cc Supervisor: Dr Macdonald Kanyangale
Cc Academic Leader Research: Professor Muhammad Hoque
Cc School Administrator: Ms Zarina Bullyraj

Humanities & Social Sciences Research Ethics Committee
Professor Shenuka Singh (Chair)
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Postal Address: Private Bag X54001, Durban 4000
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Website: www.ukzn.ac.za

AN EXPLORATORY STUDY OF FACTORS DELAYING THE COMPLETION OF ELECTRIFICATION PROJECTS IN KWAZULU-NATAL OPERATING UNIT (KZN-OU)

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