UNIVERSITY OF KWAZULU-NATAL

EMPLOYEE PERCEPTIONS OF ENERGY MANAGEMENT PROGRAMMES AT ESKOM NEW GERMANY

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ABSTRACT

Over the years, harmful impacts on the environment have led to a growing awareness of managing the environment. This trend to protect the environment has grown both locally and internationally. The increased pressure from the public, private and government structures have resulted in companies taking more responsibility for the environment. One of the major environmental areas is the management of energy. The poor planning by the South African government has resulted in serious shortage of energy (electricity) to consumers. In 2008 and 2009, Eskom could not meet the demands for electricity, resulting in load shedding across South Africa. The short-term solution was to embark on managing energy usage through promoting lower consumption and through the efficient and sustainable usage of energy. Eskom had to serve as the leaders in managing the energy usage. This took the form of developing and implementing energy management programmes, including programmes for Eskom employees. The literature research reviewed local and international approaches to Environmental and Energy Management programmes within organisations. A survey and quantitative analysis was undertaken to determine the perceptions of Energy Management Programmes by employees based at Eskom, New Germany. The population at Eskom New Germany consists of 758 employees. In total, 84 responses were received and analysed.

The findings of the study indicated that the majority of respondents were aware of Eskom's overall environmental and energy management programmes. The majority of respondents positively rated these programmes in terms of their incentives, motivation, effectiveness, support structures and communication channels. Regarding the overall energy management programmes implemented at Eskom, New Germany, the majority of the respondents were aware of them and were of the view that these programmes were very effective. One programme had a poor participation level mainly due to lack of awareness, but the respondents who did participate indicated that the programme was valuable in terms of its effectiveness. The main recommendation was to combine all the energy management programmes into one portfolio, driven by one department. This Department will be responsible for the developing, implementing and sustaining current and future energy management programmes for employees within Eskom.

TABLE OF CONTENTS

CHAPTER THREE: RESEARCH METHODOLOGY

CHAPTER FOUR: RESULTS

CHAPTER SIX: **CONCLUSIONS AND RECOMMENDATIONS**

LIST OF TABLES

LIST OF FIGURES

ACRONYMS AND ABBREVIATIONS

CFL	Compact Fluorescent Light
CO_2	Carbon Dioxide
COP	Conference of the Parties
DEAT	Department of Environmental Affairs and Tourism
DME	Department of Minerals and Energy
DSM	Demand Side Management
ECG	Electronic Control Gear
EMS	Environmental Management System
ERA	Electricity Regulation Act 4 of 2006
ESCo	Energy Service Company
IEM	Integrated Environmental Management
kWh	Kilowatt Hour
LPG	Liquefied Petroleum Gas
MOP	Meeting of the Parties
MW	Megawatt
NEA	Nuclear Energy Act 46 of 1999
NEEA	National Energy Efficiency Agency
NEMA	National Environmental Management Act 107
NERSA	National Energy Regulator of South Africa
OECD	Organisation for Economic Co-operation and Development
SABS	South African Bureau of Standards
TOU	Time-of-Use
UNFCC	United Nations Framework Convention on Climate Change
WEC	World Energy Council

CHAPTER ONE: INTRODUCTION

1.1 INTRODUCTION

Over the last two decades, publicity around environmental impacts has led to organisations taking more responsibility for the environment (Smith, 1993; Carroll and Buchholtz, 2006; Perron, Cote and Duffy, 2006, and Thornton, 2008). The increased pressure on organisations to take responsibility for the environment has in part led to the concept of corporate social responsibility. Researchers have found that corporate social responsibility has resulted in businesses acknowledging issues such as environmental preservation, sustainability, sound labour practices and product safety (Sen and Bhattacharya, 2001; Van Marrewijk, 2003; Hurst, 2004, and Blowfield and Frynas, 2005). Darnall, Henriques and Sadorsky (2008) found that business leaders and managers started to develop and implement processes and practices, training and education within their organisations to reduce environmental impacts. This research focuses on environmental responsibility and specifically, energy management awareness programmes for employees within an organisation.

Energy Management concerns the techniques, processes and activities which assist organisations to increase the efficient usage of energy thereby reducing greenhouse gas emissions and improving the air quality (Capehart, Turner and Kennedy, 2008; Eskom Demand Side Management Department, 2008a, and Energy Management Research Department, United Kingdom, 2009). In South Africa, the government adopted an energy efficiency strategy to encourage a sustainable energy sector through efficient practices (Eskom Demand Side Management Department, 2008a). The strategy was used to encourage businesses in South Africa to embark on efficient energy management practices. Eskom has established itself as a leading energy company, providing over 95% of South Africa's electricity needs and over 50% of Africa's energy needs (Van Es and Bennett, 2008, and Eskom Demand Side Management Department, 2008a). The demand for electricity over the past few years had risen due to increased investment in South Africa (Creamer, 2008). Eskom was unable to meet the increased demands, which led to

its Demand Side Management (DSM), focusing on the sustainable supply and usage of electricity through a number of energy efficiency programmes (Department of Minerals and Energy, South Africa, 2008b). DSM was recognised as a major initiative aimed at reducing energy consumption, thereby decreasing the greenhouse gas emissions (Bonneville, 2006). The DSM programmes support Eskom's environmental policy, which (i) Promotes open communication on environmental issues amongst employees and stakeholders; (ii) Promotes the efficient production and distribution of energy, and (iii) Provides education and training on the environmental issues to the employees (Sutton, 2008)

1.2   MOTIVATION FOR THE STUDY

Since 2008, South Africa has encountered varying levels of load shedding, as Eskom has been unable to meet the growing demand (Creamer, 2008; Van Es and Bennett, 2008, and Yelland, 2008). This resulted in Eskom DSM embarking on energy management programmes aimed at reducing energy consumption (Department of Minerals and Energy, South Africa, 2008a, and Eskom Demand Side Management Department, 2008b). A major energy efficiency programme for employees was put in place promoting open communication, education, and training on energy management issues. However, Eskom did not undertake any research to determine whether the energy management programmes were effective in educating and training Eskom employees. Therefore this research was designed to determine employee perceptions about whether Eskom's Energy Management Programmes were successful. The results from this research will assist DSM to modify their current programmes in order to make them more effective. Once shown to be successful, these programmes can also be recommended for use at other organisations.

1.3   FOCUS OF THE STUDY

The study was undertaken so that the results obtained could add value to the future of Energy Management Programmes within Eskom and other organisations. As stipulated by the confirmation letter from Eskom management, the findings from the study will be

submitted to the Manager of the Eastern Region and the Demand Side Management Department located in KwaZulu-Natal.

1.4   RESEARCH METHODOLOGY

The study concentrated on the Eskom region based in New Germany, Durban. Non-Random sampling was used for the study. Given time and financial constraints, convenience sampling was employed for this research. Anyone who responded to the study formed the sample. The self-administered questionnaire was accessed via QuestionPro, which is an online survey website. The population consisted of the total number of employees at Eskom, New Germany, which was 758 people. The questionnaire was distributed through the Communication Department to all employees at the Eskom New Germany offices. The response rate was poor and after three months, only 25 employees had answered the questionnaire. To remedy the situation, the 50 managers based at Eskom New Germany were requested to distribute the questionnaire to all staff within their business units. Even this approach met with little success as only 25 completed questionnaires were returned after two months. To increase the sample numbers, the questionnaires were physically administered to the staff at Eskom New Germany. As a result, a total of 84 staff completed the questionnaire. Due to the low response rate, the percentage of sample to population was low (11%). Even though Babbie and Mouton (2001) stated that a sample size of 30 is adequate for a study to be statistically sound, if the recommendation from the study is implemented, it should be carefully monitored for deviations from the desired results.

The following characteristics of the Eskom employees were covered in the research:
- Gender
- Age
- Race classification
- Education level
- Employment status
- Employment level

- Field of specialization

The analysis of the survey was used to determine the employees' understanding and response to:

- Eskom's overall environmental and energy management programmes in terms of the communication channels, incentives and support structures.
- The implemented energy management programmes at Eskom, New Germany in terms of the communication channels, incentives, support structures, barriers and recommendations.

The study entailed quantitative analysis. QuestionPro was used to collect all the data from each of the respondents. The raw data were transferred to the Statistical Package for the Social Sciences (SPSS) version 19 programme.

1.5   PROBLEM STATEMENT

In the early 1990s, Eskom delayed the expansion of their energy producing capacity as economic growth in the late 1980s did not materialise (Van Es and Bennett, 2008). Over the past few years, South Africa has experienced high economic growth rates resulting in Eskom being unable to meet the growing demands of the country (Creamer, 2008 and Yelland, 2008). This resulted in Eskom resorting to load shedding from 1st April 2008 (Creamer, 2008; Sebitosi, 2008; Van Es and Bennett, 2008, and Yelland, 2008). Load shedding had a negative impact on businesses across South Africa and on the economy.

The quickest solution in the short term was an aggressive implementation of energy management programmes aimed at educating South Africans about efficient and sustainable energy usage (Department of Minerals and Energy, South Africa, 2008a). In addition, Eskom developed and implemented a number of energy management programmes for their own employees to educate and train employees on environmental and energy efficient practices (Eskom Demand Side Management Department, 2008b). Prior to this study, there had been no proper studies undertaken to evaluate employee perceptions of the implemented energy management programmes. Therefore the

recommendations from the study will assist Eskom in developing a stronger energy management programme for employees.

1.6 OBJECTIVES

The aim of the research is important as it clearly describes the scope of work, namely 'To determine Eskom employee's perceptions towards Energy Management Programmes'. The aim allowed the research to determine whether Eskom's Energy Management Programmes were successful or not. The objectives drove the development of the questionnaire used in the collection, analyses and interpretation of the data. The objectives of the study were to determine Eskom's employee perceptions of:

1. The overall Environmental and Energy Management Programmes within Eskom.
2. The Energy Management Programmes implemented within Eskom, New Germany.
3. The support structures for participation in Energy Management Programmes implemented at Eskom, New Germany.
4. The barriers for participation in Energy Management Programmes implemented at Eskom, New Germany.
5. This research was conducted so that recommendations for an effective implementation of Energy Management Programmes may be provided to Eskom Management.

1.7 RESEARCH QUESTIONS

- What are the respondents' attitudes towards Environmental Management?
- What are the respondents' attitudes towards Energy Management?
- What are the respondents' perceptions towards the overall Environmental and Energy Management Programmes within Eskom?
- Are the implemented Energy Management Programmes effective?
- Are there support structures that facilitate and promote participation in the Energy Management Programmes?

- Are there barriers that prevent participation in the Energy Management Programmes?
- What are some of the suggestions for future Energy Management Programmes?

1.8   LIMITATIONS OF THE STUDY

The following were identified as limitations of the study:

- The study was limited to employees based at Eskom, New Germany. Therefore, future research can be undertaken in other regions.
- The sample size was limited to 85 from a population of 758 due to an apathetic response from employees and time constraints. Hence, the sample size could be increased for future research.
- The research is quantitative in nature and as such the work lacks qualitative detail. Therefore for future research, a qualitative study can be undertaken.
- The research focused mainly on the employees' perceptions, hence future research can concentrate on the employers' perceptions of energy management programmes.

1.9   STRUCTURE OF THE CHAPTERS

The dissertation was broken down into six sections:

Chapter One gives a broad overview of the Environmental and Energy Management Programmes. The motivation for the study has been explained together with the focus of the study. The problem statement, objectives and research questions have been stated. The limitations of the study were mentioned.

Chapter Two contains the review of literature on the research topic. In this chapter, a review of environmental and energy management is presented. How society and businesses handle environmental and energy management issues are considered. The first part covers environmental management and how it is managed and sustained by the different sectors (private and public) at a global and then a local level. This provides one

with different perspectives on how organisations develop and implement environmental programmes. This is followed with energy management across the world and then it is narrowed down to the local level. The final part of the chapter covers the energy management programmes administered at Eskom.

Chapter Three presents the research methodology, which was utilised in the study. This chapter provides an overview of research in general, methods of gathering data and the purpose of quantitative research in the study. The chapter also provides a detailed description of research methods applied, a description of the study location, questionnaire design, selection of sites and sample, limitations of the study, data collection and methods of data analysis used in the study.

In Chapter Four, the results of the quantitative data are presented. QuestionPro was used to develop the questionnaire, which was used to collect the data from the respondents. The raw data were transferred to the Statistical Package for the Social Sciences (SPSS) programme, which was used to analyse the data. The analysis is divided into two categories: the first category covers the demographic characteristics (independent variables) of the respondents in terms of their gender, age, race classification, level of education, employment status, employment level and area of specialisation. The second category covers the non-demographic responses (dependent variables).

Chapter Five explains the research findings in relation to the listed objectives.

Chapter Six provides a list of recommendations to address the shortcomings in Eskom's current Energy Management Programmes. The list of recommendations will assist Eskom in implementing an effective and successful Energy Management Programme. This is followed with suggestions for further research into this topic. The final part provides an overall summary and conclusion of the findings.

1.10   CONCLUSION

The introductory chapter is a summary of the research work undertaken in the study. It gives a broad outline on Environmental and Energy Management. This is followed by a discussion of the reasons for undertaking the study. The collection of data within the specified study area was described. The problem statement with the objectives and research questions, which are the crux of the study, were reviewed. The limitations of the study have been listed. The next chapter is the literature review, which uncovers aspects on Environmental Management (local and international), Energy Management (local and international) and thereafter, the study area (Eskom).

CHAPTER TWO: LITERATURE REVIEW

2.1   INTRODUCTION

In this chapter, a review of Environmental and Energy Management is provided. An examination of how society and businesses handle environmental and energy management issues, follows. The first part covers environmental management and how it is managed and sustained by the different sectors (private and public) at a global and then a local level. This provides different perspectives on how organisations develop and implement environmental programmes. The way businesses respond to energy management is analysed. The final part of the chapter covers Eskom's role in energy and environmental management issues. This final discussion is imperative as the research covers the energy management programmes administered within Eskom.

2.2   ENVIRONMENTAL MANAGEMENT

2.2.1   Environmental Management at Global Level

The environmental impact of the uncontrolled use of coal, oil and gas in the second half of the twentieth century became a major concern to the international community (Ward, 2008). The damage caused to plants, animals and buildings by acid rain and the effects on human health of poor air quality and smog have led to the emergence of agreements at national, regional and international level to control these problems (Hare and Robertson, 1998, and Omer, 2008). In the mid 80s, there was a growing awareness of climate change (known as global warming or the greenhouse effect) caused by the burning of fossil fuels (Hui, Alan and Chan, 2001). Greenhouse gases, particularly carbon dioxide (CO_2), are emitted into the atmosphere when fossil fuels are burnt, leading to an increase in the global temperature and sea levels (Hare, 1997 and Omer, 2008). The United Nations General Assembly set up a negotiating process that involved all countries including observers from business, industry and environmental organisations to adopt the international climate convention at the Earth summit in Rio de Janeiro in June 1992 by limiting their greenhouse gas emissions to the 1990 levels by the year 2000 (Camarota, 1999; Elzen, Lucas and Van Vuuren, 2005, and Makarenko, 2007). The United States

was the biggest emitter of greenhouse gases and refused to sign the agreement based on the negative impact it would have on their economy (Fletcher, 2005).

In March 1995, the Conference of the Parties (known as COP1), held in Berlin, agreed that the Convention's greenhouse gas commitments from the forty-two countries were inadequate; it failed to agree on new emission targets (Fletcher, 2005 and Makarenko, 2007). This resulted in the emergence of the 'Berlin Mandate'' which was aimed at agreeing and legally binding countries to a greenhouse gas limitation (Hare and Robertson, 1998, and Fletcher, 2005). The negotiations on the Berlin Mandate were carried out by a committee, which became known as the Kyoto Protocol (Hare and Robertson, 1998, and Fletcher, 2005). On December 1997, in Kyoto, Japan at the third Conference of the Parties, the Kyoto Protocol to the United Nations Framework Convention on climate change was adopted (Zhicheng and Porter, 2000, and Makarenko, 2007). This was the first legally binding agreement for developed countries to reduce by at least five percent the 1990 levels of greenhouse gases by 2008-2012 (Robertson and Hare, 2005). A total of 141 nations, including developing countries (which had no binding obligations under the treaty), ratified the Protocol when it came into force on the 16 February 2005 (United Nations Climate Change Conference, 2005).

However, the United States was not bound by the terms of the Protocol, as it did not ratify the protocol (Fletcher, 2005). Due to intensive pressure from the fossil fuel industry, many developed countries refused to agree on the kinds of cuts in their domestic greenhouse gas emissions. Hence in December 2005, Canada called the Meeting of the Parties (MOP), where signatory nations agreed to extend the life of the Kyoto Protocol beyond 2012 and increase the reductions in greenhouse gas emissions (United Nations Climate Change Conference, 2005 and Birch, 2009).

Ulhoi and Madsen (2001), and Makarenko (2007) state that increased environmental awareness at a global level such as the Kyoto Protocol, led to an increased awareness of managing the environment. A number of researchers found that due to the intensive

global awareness on protecting the environment, new concepts such as sustainability, corporate social responsibility, corporate governance and triple bottom line approaches emerged (Hurst, 2004; Barrows, 2005, and Keene and Pullin, 2011).

2.2.2 International Environmental Management in Businesses

According to Carroll and Buchholtz (2006), a business can be defined as a profit-making organisation, which can range from a small to medium-sized proprietorship, to partnership, to large corporations. Carroll and Buchholtz (2006) further states that larger companies usually have significant influence on the general public; thus their ethical, social and environmental responsibilities were closely monitored (Ramus, 2002). Previously, managers and business leaders were mainly concerned with the maximisation of profits; however, corporate scandals and environmental impact such as carbon footprints have drawn huge media attention and modified management's focus (Ramus, 2002 and Harding, 2007). Thornton (2008: 14) argues, "We all have a personal responsibility to each other and the world around us". A number of researchers (Hurst, 2004; Van Marrewijk, 2004, and Harding, 2007) have found that businesses can no longer operate in isolation without taking cognisance of the social, political, economic and environmental impacts. For the past twenty years, there has been an increased awareness of environmental management within organisations (Clarke and Kourie, 2009). The Kyoto Protocol has also played an important role in forcing businesses to reduce their global emissions of CO_2 and other greenhouse gases to prevent global warming (United Nations Climate Change Conference, 2005 and Birch, 2009). The drive towards businesses taking more responsibility for their environment was referred to as Corporate Social Responsibility. Blowfield and Frynas (2005) viewed Corporate Social Responsibility (CSR) as a variety of theories and practices whereby (i) Companies are accountable for their impacts on society and the natural environment and (ii) Companies are responsible for their suppliers and customer's behaviour. These corporate social responsibility actions relate issues such as environmental preservation and sustainability, labour practices, product safety and most importantly activities that achieve a level of responsibility (Sen and Bhattacharya, 2001).

According to Perron et al (2006), businesses have to take into account the environmental impact due to (i) Environmental legislation or regulation; (ii) Demonstrations by Green peace movements; (iii) Negative media attention; (iv) International Agreements (Kyoto Protocol), and (v) Pressure from consumers demanding environmentally friendly goods. Perron et al (2006) further state that many businesses in Canada have endorsed the environmental management in their company's policies and practices. Remmem and Lorentzen (2000), and Hillary (2008) found that many companies that endorsed environmental awareness programmes in their business experienced financial savings and reduced risk of liability. Researchers have found that environmental education and training programmes have provided employees with tools to effectively protect the environment: (i) Sony recognised the need for education and training of employees to achieve their environmental goals, and (ii) Green Management encouraged employees from marketing to repair services to incorporate environmental issues (Cook and Seith, 1992; Remmen and Lorentzen, 2000, and Sammalisto and Brorson, 2008). Clearly, the majority of businesses in Canada encouraged environmental education and training programmes for their employees. Some researchers also claimed that businesses whose environmental programmes did not include employee training and education are bound to fail (Saunders and McGovern, 1993; Ulhoi and Madsen, 2001, and Hillary, 2008).

Perron et al (2006) conducted research on the effects of environmental education and training programmes on employees within two Canadian Electric utilities. The following results were obtained:

- There is a need for a more sustainable approach in the business.
- In order for environmental education and training to be effective, there is a need for a significant change in the culture of the business.
- The employer and employees must be involved from the development and implementation phases of the environmental programme. This will ensure that the design, content and delivery of the programmes are beneficial to all employees.
- Finally, businesses must treat their training and environmental programmes like financial investments.

Claver, Lopez, and Molina (2007) argue that there was an assumption in the early days that both the environmental protection measures and the regulations reduced a company's competitiveness due to the cost implications arising from the introduction of clean techniques. This belief did not take into consideration the future benefits of protecting the environment. However, over the years, numerous studies were undertaken for the purpose of changing this negative attitude towards the environmental programmes. For example, Berchicci and King (2007) were able to illustrate that environmental management programmes were beneficial to the financial performance of companies in the United States. In addition, Fernandez, Junquera, and Ordiz (2003) found that environmental programmes within numerous businesses in the United States had a positive impact on the labour force: the companies that implemented environmental programmes were able to attract, motivate and retain skilled employees. Fernandez et al (2003) further state that an environmental programme will succeed if the employer gains the understanding and support from the employees within the organisation.

According Darnall et al (2008), companies in the United States started to slowly recognise the corporate and environmental benefits of implementing Environmental Management Systems, which included:

- A cost reduction at the operational level resulting in an improved product.
- Creating an attractive image of the company, thereby making it more competitive.
- Allowing companies to expand locally, nationally and internationally.
- Developing and manufacturing product parts with minimal impact on the environment.
- Minimising environmental impact of companies through environmental management initiatives, which included waste reduction, reusing and recycling, waste treatment and use of sustainable resources.

According to Franklin (2008), after years of research into the implementation of environmental programmes, companies finally realised that these programme were able to ensure a sustainable competitive advantage. A study by Claver et al (2007) confirmed

that environmental management led to the company's increased competitive advantage and economic performance.

Canada has more than 2 million small and medium-sized enterprises (SMEs) (Statistics Canada, 2005) which are responsible for 43.7% of the manufacturing industry's GHG emissions (Perron, 2005). A number of SME studies have indicated the reduction of costs and increased revenues due to the implementation of environmental initiatives (Thorpe and Prakash-Mani, 2003 and Fresner and Engelhardt, 2004). However in Canada, Perron (2005) found that the following barriers exist with regards to the implementation of environmental initiatives within SMEs:

- The lack of financial resources to implement some of the environmental programmes.
- The lack of human resources both in quantity and technical expertise.
- The lack of eco-efficiency information about SMEs.
- Negative attitudes and perceptions of environmental initiatives by top management and staff.
- Resistance to change within company culture.

Perron (2005) found that a number of approaches were developed to overcome some of the barriers:

- The implementation of incentive programmes e.g. The Eco-Efficiency Partnership Programme
- The provision of consultants and technical experts in the eco-efficient area.
- The provision of basic information on the benefits and opportunities of environmental efficiency initiatives e.g. Enviroclub.
- Marketing the successful SME projects.

2.2.3 South African Environmental Management in Businesses

The United Nations Framework Convention on Climate Change (UNFCC) aimed to stabilise the concentrations of greenhouse gases into the atmosphere and was ratified by

the South African government in August 1997 (United Nations Industrial Development Organisation, 2003). However, it was realised that the UNFCC commitment was insufficient in controlling the greenhouse gas emissions, thus resulting in the South African government acceding to the Kyoto Protocol in July 2002 (United Nations Industrial Development Organisation, 2003 and Department of Environmental Affairs and Tourism, South Africa, 2004a). The South African government recognised the need to address climate change issues as they would build international competiveness, create new infrastructure, transform the economy, reduce poverty and improve the quality of life for all South Africans (Robertson and Hare, 2005).

Currently, businesses in South Africa view environmental reporting as a reputation enhancing exercise rather than a strategy to reduce greenhouse gas emissions (Birch, 2009). The climate change and its effects are bound to impact on South African businesses, especially since the government has offered businesses that endorse environmental initiatives tax incentives and savings (Robertson and Hare, 2005). Following COP15 in Copenhagen in 2009, South Africa went on an aggressive carbon-lowering drive and has introduced renewable energy feed-in tariffs (United Nations Industrial Development Organisation, 2003). According to Carter (2011), environmental and sustainable issues have become a reporting requirement for businesses under King 3. It was emphasised that businesses need to take a more active part in climate change and sustainability areas, particularly at COP 17, as these issues will soon be found in the national policy of South Africa (Carter, 2011). One can clearly see that the South African government is taking steps to protect the environment and maintain its sustainability. It is now up to businesses to take an active part in protecting the environment rather than waiting for new legislation to be imposed on them.

Strydom and King (2009) state that Environmental Management in South Africa is a set of strategies and activities that is designed to help the business and government sectors to protect the environment which will inevitably prevent social problems such as poverty, crimes and diseases. According to the Department of Environmental Affairs and

Tourism, South Africa (2004b), the constant assessment of the environment and usage of sustainable management tools was imperative for one to effectively manage the environment. Clearly, the South African government highlights the importance of managing the environment as a key component to maintaining sustainability.

Strydom and King (2009) find that the current South African environmental laws governing the majority of company practices can lead to a reduction in environmental problems. In other words, environmental problems can be minimised only if people and companies in South Africa take more responsibility for their actions on the environment. For example, there are laws in South Africa, which prohibit companies from dumping untreated waste. Hence, if companies take the responsibility of treating the waste before it is disposed of, the environment can be protected.

2.2.4   Developing an Environmental Culture in the Business

Robbins and Decenzo (2003) define organisational culture as the shared behaviour of employees within an organisation. In other words, an organisation's culture determines the behaviour of its employees. There are two ways to develop and implement an environmental culture within the organisation. One is the top-down approach, where top management decides to incorporate the environment in its corporate strategy, establish an environmental policy, guidelines and principles and then disseminates these throughout the company (Jansson, Nilsson and Rapp, 2000, and Linnenluecke and Griffiths, 2010). This means that the environmental policy is first developed at top management and implemented by all employees. The success of an environmental programme is dependent on the participation of all employees within an organisation. The bottom-up approach occurs when the middle and lower employees develop environmental programmes for the organisation (Welford, 1997; Stone, 2000, and Pooley 2003). This type of approach is more interactive and allows all employees to participate. The support from top management is vital for the bottom-up approach to succeed. If an environmental programme is not supported by top management, the programme is likely to fail (Welford, 1997; Stone, 2000, and Pooley 2003).

According Welford (1997) and Pooley (2003), the following factors are impediments to environmental cultural change within an organisation:

 (i)   When employees have their own ideas about the environment e.g. some employees believe that it is expensive to attend to environmental issues, which will eventually be forgotten.

 (ii)   When employees are uncertain about the future as a result of changes within the organisation. For example, employees need reassurance when changes occur within the organisation.

(iii)   When employers portray different opinions regarding environmental issues to the employees.

Wolters, Bouman and Peters (1995); Welford (1997); Harding (2007), and Kreitner and Kinicki (2007) list the following factors as facilitators to environmental cultural change within an organisation:

 (i)   Good working conditions which encouraged staff to adopt environmental issues within their jobs. For example, staff will not consider the environment if they are exposed to stressful physical conditions (bad lighting or ventilation, dust, noise, toxics) or social conditions (low job security, punitive motivation systems).

 (ii)   The involvement of the employer and employees during the development and implementation of environmental programmes.

(iii)   A flat organisation structure, which allows every employee to recognise the ecological aspects of their work.

(iv)   The commitment and positive attention given to environmental protection by employers, which can reinforce an environmental culture.

 (v)   The introduction and implementation of incentives.

According to Stone (2000); Pooley (2003), and Harding (2007) the following four factors are vital for an organisation to maintain and implement change:

• Commitment from senior management and employees is essential for effective implementation of change.

- Motivation of employees through respect, joy, acknowledgement and salaries, are imperative for changes to be effective.
- Employers should ensure that there is continuous, honest and open communication between employees and themselves.
- The employers should ensure that they have the time and funds for implementing changes within the organisation.

2.3   ENERGY MANAGEMENT

2.3.1   Energy Management in Businesses

The management of energy can be defined as the techniques and processes that drive efficient energy use (Energy Management Research Department, United Kingdom, 2009), so that profits are maximized and costs are minimised (Capehart et al., 2008). There are many businesses in the United Kingdom that have developed and implemented energy management awareness programmes. For instance, a United Kingdom (UK) report stated that employees felt that their organisations needed to provide the foundation and support for environmental programmes to be successful (Energy Management Research Department, United Kingdom, 2009). Capehart et al (2008) list some of the objectives that businesses in the UK tried to achieve by implementing energy management programmes:

- Improve energy efficiency, which resulted in reduction of energy usage.
- Reduce acid rain and limit global climate change.
- Reduce ozone depletion and improve the quality of air.
- Promote and encourage positive communications on energy-related issues.
- Develop and maintain the monitoring, reporting and management phases.
- Promote research and development, which leads to increased returns from energy investments.
- Prevent and reduce the effects of load shedding.

By adopting energy management strategies, businesses can gain control over energy spending, turn costs into opportunities, reduce risk and inform smarter energy-related decisions.

2.3.2 Design of an Energy Management Programme for a Business

According to the Canadian Energy Efficiency Department (2004); Weil (2006), and Capehart et al (2008), the following criteria were essential when businesses developed their Energy Management Programmes:

- There is a need for commitment by top management in order for successful implementation and operation of the energy management programme. There are two situations that are likely to occur when designing an energy management programme. A top-down approach occurs when the employees are told by management that energy programmes should be implemented. The bottom-up approach occurs when employees have to promote programmes on energy to the management team.

- The business must designate a person who will oversee the coordination of the energy management programmes. The energy coordinator should have energy management as part of his or her job description. Most importantly top management must ensure that they provide the energy co-ordinator with adequate resources.

- An energy management programme should have two subcommittees, the technical and steering committees. For example, the technical committee (chemical, industrial, electrical, civil and mechanical engineers) can provide technical assistance when necessary to the energy coordinator. In contrast, the steering committee can help to guide the activities of all energy management programmes. This committee can also assist in ensuring that communication regarding energy management programmes is taken to all levels within the organisation.

- Top management should allocate energy costs down to 'cost centres' within the organisation e.g. if energy costs are charged directly to the production centres, then the managers will be able to see how much energy is used. By informing the manager of the cost implications arising in the production centre, he or she will be motivated to improve the energy usage. This will ensure that the managers promote cost-effective usage of energy.

- It is important that an organisation has an effective and efficient reporting system. The reporting system can provide data on the energy consumption. The energy consumption data can illustrate whether the Energy Management programmes are achieving the organisation's goals. The reporting system should also be reviewed periodically to ensure that the programme is working.

- The majority of energy management coordinators found that there was a need for extensive training in energy management. The training should be an on-going activity for all employees as there are always changes that occur for employees at all levels, as well as new technology and production methods. The energy co-ordinator must take full responsibility for the energy management training within the organisation (from designing to implementation, assessment and follow-up).

2.3.3 Implementation of an Energy Management Programme in a Business

The Action Energy and Carbon Trust (2004), and the Canadian Energy Efficiency Department (2004) found that the following items could contribute to a successful implementation of an energy management programme:

(i) Visibility of the Programme Start-up

The energy management programme must have the support of all the employees and the employer. The energy co-ordinator must ensure that employees: (a) understand the need of the programme; (b) are informed about how the programme will affect their duties and what is expected of them, and (c) know that the programme has full management support. It is vital that this information is communicated to all employees within the organisation via a comprehensive memo or the use of media (radios, television, posters, newspapers and billboards). Meetings and presentations can be used to inform current and new employees.

(ii) Demonstration of Management Commitment

The commitment by management must be seen by all employees if the programme is to be successful. There are some organisations that show their commitment to energy

efficiency by developing an energy policy. Some of the ways that management can show their commitment include:

- An employee can be acknowledged for his or her efforts during the performance appraisal.
- The management team should send out newsletters depicting the current results of the programme and the plans for the future.
- If an energy management programme is cost-effective, it should be funded. Hence energy management co-ordinators should ensure that the programme is cost-effective.

(iii)   Early Projection Selection

An energy management co-ordinator should look at projects that have more positive outcomes rather than negative ones. Some of th**e** successful projects include:

- The energy management co-ordinator recommending that a dimly lit refrigerator warehouse switches from mercury vapour lamps to high pressure sodium lamps (efficient source). Hence, less energy was consumed for the lighting and the employees were happy, as their light levels were higher than before.
- It is important that steam leaks are repaired, as they can be quite uncomfortable and harmful for employees working in the area.
- It is cost-effective to insulate steam, hot water and lines carrying hot fluids and tanks. This insulation prevents unnecessary heat loss and in turn saves energy.
- Organisations should be encouraged to install high efficiency motors, which drastically reduce the electrical utility costs.

2.3.4   International Energy Management Programmes in Businesses

Energy management is vital in improving energy efficiency, reducing greenhouse gas and decreasing the energy costs within a business (Action Energy and Carbon Trust, 2004, and Energy Management Research Department, United Kingdom, 2009). In the United States, the Federal Energy Management Programme developed an energy management programme for employees within the federal government. One of the areas was an

employee energy awareness programme. The goal of the energy awareness programme was to reduce the consumption of energy in the federal department by creating energy awareness among energy users in the company and to motivate employees to efficiently utilise energy. In summary, the energy awareness programme was designed to inform employees about energy conservation and to encourage employees to utilise energy more efficiently (Weil, 2006).

2.3.4.1 Stages of Energy Management Programmes

Weil (2006) states that the Federal Employee Energy Programme was designed to: (i) save money; (ii) reduce greenhouse gas emissions, and (iii) protect the environment and natural resources. In addition, Weil (2006) indicates that the Federal Employee Energy Programme required the involvement of the management team and employees during the development, implementation, and follow-up stages. The following studies (Action Energy and Carbon Trust, 2004; Canadian Energy Efficiency Department, 2004; Carbon Trust, 2005 and United States Energy Efficiency Department, 2007) and researcher (Weil, 2006) have listed the following steps in the planning, implementation, checking and reviewing, and maintenance of a successful energy management programme within an organisation:

(i) Planning and Implementation Phase: The support and resources, target audiences and communication channels need to be considered. Firstly, it is important to determine and assess the energy management activities, including the resources and finances within the organisation. This will assist in determining reasonable and effective energy management goals and objectives for the organisation. In fact, Carbon Trust (2005) indicates that an energy policy demonstrated the organisation's public commitment to energy efficiency and the environment both internally and externally.

The objectives will assist in determining the appropriate communication channels and incentives for the energy management programme. There is a range of communication channels and tools that can be utilised, such as video tapes, in-house web casts,

newsletters, pamphlets and brochures, bulletins, press releases, signs and stickers, posters, paycheque notices, displays and booths, information packages for new employees, competitions, special events, workshops, departmental meetings, emails, usage of external experts to present energy management information, word of mouth and the internal website. Piell (2009) found that more staff at the University of Iowa could be reached by utilising the intranet for spreading awareness of energy management initiatives. Carbon Trust (2005) and Weil (2006) placed more emphasis on written material such as brochures and posters as the communication channel for creating awareness regarding the energy management programmes for employees.

Waters (1998) and the Canadian Energy Efficiency Department (2004) state that internal and external communications should be established and maintained for a successful implementation of energy and environmental management programmes. According to Owens and Driffill (2008), communication channels are vital to increase awareness and change people's attitudes towards energy related issues. Some studies (Carbon Trust, 2007 and United States Energy Efficiency Department, 2007) found that the correct communication channel is a key component in the implementation of energy management programmes. The Canadian Energy Efficiency Department (2004) goes one-step further and suggests that the existing lines of communication should first be assessed and then modified to suite the objectives of the energy management programme.

Studies have found that a variety of motivational strategies (e.g. incentives) assisted in encouraging employees in participating in energy management programmes and practising energy efficient behaviour (Canadian Energy Efficiency Department, 2004; Carbon Trust, 2005; Weil, 2006, and United States Energy Efficiency Department, 2007). One study (United States Energy Efficiency Department, 2007) suggested that incentives should be determined by understanding the motivational factors that encourage employees to participate in energy management programmes. Weil (2006) adds that both tangible and intangible incentives were effective for reinforcing and promoting energy management programmes. The incentives should: (i) encourage energy efficiency

behaviour amongst employees; (ii) be cost effective, (iii) and be consistent with the organisation's regulations. Studies (Canadian Energy Efficiency Department, 2004; Carbon Trust, 2005; Weil, 2006, and United States Energy Efficiency Department, 2007) have found that the key to a successful energy management programme is to identify a variety of incentives (personal or group) that would encourage employee participation in energy management programmes. Examples of incentives are money, calendars, coffee mugs, key chains, t-shirts, competition prizes, certificates, bumper stickers and special parking (Canadian Energy Efficiency Department, 2004; Carbon Trust, 2005; Weil, 2006, and United States Energy Efficiency Department, 2007). Some studies encourage the usage of incentives such as awards, promotional materials (t-shirts, coffee mugs, caps) and energy-saving devices such as energy efficient bulbs and aerators (Canadian Energy Efficiency Department and Weil, 2006). One study even suggested that the percentage of saved energy costs should contribute to staff bonuses.

The United States Energy Efficiency Department (2007) found that low-cost, on-going incentives are more effective in implementing energy management programmes. The proposed energy management with the finances and budgets should be taken to management for support and commitment. A number of studies (Action Energy and Carbon Trust, 2004; Canadian Energy Efficiency Department, 2004, and Weil, 2006) have indicated that the support from management was imperative for the success of an energy management programme.

(ii) Checking and Reviewing Phase: The measurement of programme success, feedback and reports to staff and management needs be compiled and distributed. The measurement of the organisation's progress towards certain targets will assist in determining the success of the energy management programme. Carbon Trust (2005) indicated that measuring energy consumption during the energy management programme revealed whether the targets were met. In addition, it would assist in modifying future energy management programmes. The Carbon Trust (2005) and United States Energy

Efficiency Department (2007) found that compiling and analysing employees' feedback assisted in gauging the effectiveness of the energy management programme.

(iii) Maintenance phase: The energy culture, new employees and momentum need to be maintained. Studies (Action Energy and Carbon Trust, 2004; Canadian Energy Efficiency Department, 2004, and Weil, 2006) have found that publications of outputs from energy management programmes motivated employees to participate in the programmes. Weil (2006) encouraged attendance at energy management programmes during the performance appraisal process for employees.

2.3.5   Energy Management in South Africa

In South Africa, the government has proposed an efficient energy strategy. The vision of the strategy is: (i) to develop a sustainable energy department, (ii) to promote efficient energy practices, and (iii) to prevent harmful impact on the environment (Eskom Demand Side Management Department, 2008b). The government has placed energy management at the forefront of sustainable development. This positive strategy was set to encourage South African businesses to embark on efficient energy management practices. Electricity is one of the key aspects that affect the South African economy and the upliftment of poor people through job creation and the electrification programme (Ward, 2008). In 2008, the demand for electricity exceeded supply, which resulted in load shedding (Creamer, 2008 and Yelland, 2008). Strydom and King (2009) state that coal is South Africa's only economically viable energy resource. However, it is a finite resource and South Africa needs to look at alternatives. Renewables are significant but their harnessing still needs considerable development and cost reduction. Hence, the South African government needs to provide subsidies for the harnessing of energy from renewable resources (Ward, 2008). During March 2005, the government approved a strategy that aimed to improve efficient energy usage of 12% by the year 2015 (Department of Minerals and Energy, 2005 and Eskom Holding Limited, 2008). Although the 2008 electricity generation crisis had a negative impact on economic

growth, it has had the advantage of focusing attention on energy-efficiency measures (Strydom and King, 2009).

It is quite evident that energy is the key driver of social and economic development. The world is now faced with the unstable global energy access structure, which impacts on the economic, environmental, and security costs. Hence, energy sustainability has become a key challenge for government and private sector entities, more especially after global warming has become a major issue worldwide. Section 24 of the South African Constitution clearly indicates that all South Africans are entitled to a clean and healthy environment (Eskom Holding Limited, 2008). The National Environmental Management (NEMA) Act 107 of 1998 gives clear guidelines to decision-makers within organisations on issues pertaining to the environment (Department of Environmental Affairs and Tourism, South Africa, 2004b). These organisations can assist by providing guidelines for the coordination of environmental services. The Act defines pollution as any modification in the environment caused by dangerous emissions, which may be hazardous to humans and the ecosystem (Strydom and King, 2009).

The Department of Minerals and Energy published a Draft National Energy Bill in June 2008, which highlighted the following issues (Department of Education, South Africa, 2010):

- the supply, optimization and utilisation of energy;
- the establishment of National Energy Modelling and Information Agency;
- integrated energy planning;
- the formation of a South African Energy Development Institute that would incorporate energy research and implement energy efficiency measures, and
- the security of supply including strategic stocks.

The Bill became more public when Eskom started to schedule the usage of electricity (load shedding) to prevent a collapse in the supply of electricity. The Electricity Regulation Act 4 of 2006 (ERA) was established to guide and regulate the supply of

electricity. The Act focused on the sustainable usage of electricity and alternate energy resources (National Energy Regulator of South Africa, 2010). The South African Nuclear Energy Corporation was established to promote future studies, education and training in the area of nuclear power (Department of Minerals and Energy, South Africa, 2005b). South Africa's legislative and other measures on energy are being dominated by economic development and environmental sustainability concerns. Scientific evidence on carbon emissions and global warming has contributed significantly to this change of mind (Strydom and King, 2009). According to Fawkes (2005), the incentives for implementing energy efficiency programmes in the South African industry included: (i) increasing the profits; (ii) reducing the greenhouse gas emissions, and (iii) increasing the potential of international investments.

2.4   ESKOM

Eskom is a state-owned enterprise that employs approximately 30 000 individuals. It was founded in 1923 (Praetorius and Bleyl, 2006, and Hallowes, 2009). Over the last century, Eskom has supplied 95% of South Africa's electricity and also 50% of Africa's electricity (Van Es and Bennett, 2008, and Eskom Demand Side Management Department, 2008a). Eskom is one of the top seven countries in the world in terms of generating electricity (Sutton, 2008). Eskom business involves the generation, transmission and distribution of power to the commercial, agricultural and residential sectors (Eskom Demand Side Management Department, 2008b).

2.4.1   Eskom's Environmental Policy

The Eskom Annual Report of 2006 highlighted Eskom's commitment to economic, environmental and social goals, to a sustainable environment, to changing the lives of under privileged people and finally, to diversify its markets, products and services (Eskom Holding Limited, 2006). Clearly, Eskom is geared to improving the current conditions of the South African physical and social environment. Eskom's environmental policy emphasises the following aspects:

- Employees and other stakeholders are encouraged to communicate on environmental matters;
- Creating and maintaining a system for managing the environment which will prevent pollution and contribute to the betterment of the business;
- Promoting the efficient production and distribution of energy;
- Providing education and training on environmental issues to employees (Sutton, 2008).

The Eskom Build Programme cannot solve the supply constraints in the short term as it takes approximately 8 years to construct a new power station (Eskom Demand Side Management Department, 2008a and Hallowes, 2009). The only way forward was to focus intensively on managing the demand in the short term. Hence, Eskom's Board of Directors stressed the Demand Side Management (DSM) Programme, which will reduce Eskom's peak demand supply requirement (Sebitosi, 2008 and Eskom Demand Side Management Department, 2008a).

2.4.2 History of Eskom's Demand Side Management

Firstly, Demand Side Management (DSM) refers to the monitoring of consumer's electrical consumption so that it can be changed to a more sustainable and efficient usage (Moses, 2002). DSM started in 1991 with investigative projects and has grown into an efficiency electricity project across South Africa (Moses, 2002 and Bredenkamp and Atkinson-Hope, 2009). The first DSM project, Bonesa, was sponsored by Eskom; the Global Environment facility spanned over a three year period (Praetorius and Bleyl, 2006; Eskom Demand Side Management Department, 2008a, and Bredenkamp and Atkinson-Hope, 2009). The main aim of this project was to introduce efficient lighting systems in the form of compact fluorescent lamps (CFL). A massive drive of customer education, advertising and marketing was carried out to promote the usage of CFLs. The price of a CFL dropped from R80 per unit in 1999, to R10 per unit in 2004 (National Energy Efficiency Agency of South Africa, 2008).

The National DSM finances were accepted in September 2002, which resulted in the following initiatives: (i) the setup of DSM business roles and functions; (ii) client training and education programmes, and (iii) the formation of the Energy Services Company or ESCo (Department of Minerals and Energy, South Africa, 2008a and Wang, Capoor, and Limaye, 2010). Eskom saw a saving of 197 MW in 2004 which was an increase from 2003 (Eskom Demand Side Management Department, 2008a). DSM had implemented an awareness programme in schools called the 'Counting the Cost of Energy' which focused on learners at schools. This proved to be very effective and informative (Eskom Demand Side Management Department, 2008b). DSM increased the energy savings to 171 MW in 2005. There were approximately thirty-two companies that agreed to support the national efficiency strategy on energy (Department of Minerals and Energy, South Africa, 2008b). Eskom provided 8 million CFLs to the South African communities, an initiative which was meant to encourage communities to use energy efficient lighting, thereby reducing the consumption of electricity. The national rollout of residential load management was aimed at helping consumers to manage their electricity consumption during peak hours (Botha-Moorlach and Mckuur, 2009).

In 2006, the Western Cape was hit hard with the energy crisis. The implementation of the Accelerated Demand Side Management Plan resulted in a saving of 500 MW per day (Eskom Research Department, 2008 and Wang et al., 2010). The programme consisted of various DMS projects, including: (i) Efficient lighting; (ii) The usage of diesel generators; (iii) Increased efficiency measures by the industry and municipality; (iv) Providing incentives using efficient appliances; (v) Encouraging gas usage for cooking and heating, and (vi) Encouraging solar water heating (Eskom Research Department, 2008 and Eskom Demand Side Management Department, 2008b).

2.4.3 The Accelerated Demand Side Management Plan

The Accelerated Demand Side Management Plan ran from April 2007 to March 2011. The plan had four objectives (Eskom Demand Side Management Department, 2008b and Wang et al., 2010):

- To achieve and sustain 3000 MW of electricity reduction during the evening peak period (18h00 to 20h00) by March 2011, and a further 5000 MW by March 2026, through short, medium and long term initiatives.
- To support the forecast economic growth alongside the capacity expansion drive by freeing up additional capacity.
- To contribute to the effective operation of gas turbines due to high fuel costs.
- To ensure effective co-operation between the National Energy Efficiency Agency (NEEA), Department of Minerals and Energy (DME), National Energy Regulator of South Africa (NERSA) and Eskom.

2.4.3.1 CFL Exchanges

The energy efficiency lighting programme was the exchange of CFLs for incandescent lamps with no costs to consumers (National Energy Efficiency Agency of South Africa, 2008). CFLs use up to 75% less power and last up to 10 times longer than incandescent lamps (Botha-Moorlach and Mckuur, 2009). In 2005 and 2006, Eskom distributed 5 million CFLs in the Western Cape and 4 million CFLs in KwaZulu-Natal and Gauteng (Bredenkamp and Atkinson-Hope, 2009). The CFL rollout in the Western Cape region created 2000 temporary jobs and also resulted in a major saving of 229 MW (Botha-Moorlach and Mckuur, 2009). By June 2007, Eskom was able to achieve a 95% participation level from consumers, which resulted in savings of 65 MW (Eskom Research Department, 2008). In 2009, Eskom went on a drive to install 16 million CFLs which involved the following: (i) Mass rollouts at homes to exchange CFLs for incandescent bulbs; (ii) The Retailer Exchange Programme which involved the exchange of incandescent bulbs for CFLs at points within retailers, and (iii) The rollouts of CFLs to Eskom, corporate and government employees and offices (National Energy Efficiency Agency of South Africa. 2008; Eskom Demand Side Management Department, 2008b, and Bredenkamp and Atkinson-Hope, 2009). The customers who participated in the efficient lighting programmes included Shoprite Checkers, Sanlam, Woolworths, Game, Pick and Pay and Pep Stores (National Energy Efficiency Agency of South Africa. 2008;

Eskom Demand Side Management Department, 2008b, and Bredenkamp and Atkinson-Hope, 2009).

2.4.3.2 Water Heating

Studies revealed that water heating consumed the most energy by domestic and industrial entities. It was found that 40% of energy consumption during peak times in the Western Cape resulted from domestic water heating (Eskom Demand Side Management Department, 2008b and Bredenkamp and Atkinson-Hope, 2009). Hence programmes encouraging solar water heating and geyser blankets were introduced to reduce energy consumption due to conventional water heating. The Solar Water Heating Programme offered incentives to consumers that replaced their existing heating geysers with solar heating geysers. The installations of the 150 000 geyser blankets in the Western Cape were subsidised by Eskom (Eskom Holding Limited and City of Cape Town, 2010). Eskom also introduced ripple relay systems in Table View, Kraaifontein, Kuils River and Eversdal, which allowed one to switch the geyser on or off from a remote location. This assisted to reduce the load consumption during peak times. These projects had saved an approximately 5.5MW in July 2006. The customers who participated in the upgrade and retrofitting of energy savings solutions in the Cape included eleven Southern Sun Hotels in the Western and Eastern Cape, Old Mutual Properties and Volkswagen (Eskom Demand Side Management Department, 2008b and Eskom Holding Limited and City of Cape Town, 2010).

2.4.3.3 Shower Heads

The use of efficient shower heads was highly effective in saving both electricity and water for many residential and commercial customers (Eskom Demand Side Management Department, 2008b). The energy saving shower heads saved up to 60% on electricity and water whilst the energy saving handheld showers saved up to 50% on electricity and water (Eskom Demand Side Management Department, 2008b).

2.4.3.4 Load Limiting and Smart Metering Devices

Load reduction devices included the use of intelligent smart meters and load limiting devices (Eskom Demand Side Management Department, 2008a). Smart metering technology with integrated load limiters and time-of use tariffs offered the ability to automatically reduce the customer's non-essential electricity consumption in times of system constraints, while still providing sufficient electricity for essential appliance usage (Sutton, 2008). Smart metering facilitates the effective implementation of the Power Conservation Programme to customers by providing accurate monthly meter readings and improved energy management communications between customer and distributor (Eskom Demand Side Management Department, 2008a). The Ministry of Minerals and Energy made it compulsory for any customers who utilised 1000 kWh or more to have a smart system (Eskom Demand Side Management Department, 2008b).

2.4.3.5 Energy Efficient Motors

The Eskom Energy Efficient Motors Programme was designed to create an awareness of the contribution motors make to the increased national electricity savings. The companies which purchased motors that ranged from 1.1 kW through to 90 kW qualified for subsidies. The 1.1kW unit qualified for a discount of R400 and the 90 kW units qualified for a subsidy of R3500 (Mthombeni, 2008 and Eskom Demand Side Management Department, 2008b). The efficient motors available to industrial consumers on the programme were rated according to the European Union efficiency standards (Mthombeni, 2008 and Eskom Demand Side Management Department, 2008b).

2.4.3.6 Demand Side Management Programme at Schools

The aim of the programme was to create awareness, understanding, buy-in, commitment and ownership of the energy efficiency concept in schools. The programme included development of resources and retrofitting schools that had been identified by the Education and Public Works department. Eskom had retrofitted 100 schools in KwaZulu-Natal and the Western Cape. In addition, the programme rolled out 100 000 CFLs at the

participating schools (Eskom Demand Side Management Department, 2008b and Bredenkamp and Atkinson-Hope, 2009).

2.4.3.7 Eskom Billion kWh Programme

This programme, which was launched in 2006, focused on education and awareness initiatives that reduced energy consumption at Eskom sites, employee households, and commercial consumers through technically feasible and economically viable efficiency improvements within the organisation (National Energy Efficiency Agency of South Africa, 2008; Van Es, 2008; Eskom Demand Side Management Department, 2008b; Bredenkamp and Atkinson-Hope, 2009, and Mokoena and Qhala, 2010). The Eskom Employee Roll-Out Programme aimed to create an energy efficiency culture amongst employees to make them ambassadors for the energy efficiency drive in the greater community (Eskom Demand Side Management Department, 2008b and Mokoena and Qhala, 2010). The CFL roll-out was also one of the Billion kWh initiatives, which aimed at retrofitting Eskom sites and offices with energy efficient lighting technologies (Mokoena and Qhala, 2010). The first project was retrofitting 5 Eskom buildings in the Western Cape, which proved to be highly successful and in addition created an awareness of energy efficiency and power conservation with Eskom Employees (Mokoena and Qhala, 2010).

2.4.3.8 Marketing and Communications Campaigns

An extensive marketing and communications strategy was implemented to support Eskom's Energy Savings initiatives, which included advertisements (print and radio), public relations, and education (Davis, 2010). The campaigns included: (i) The National Power Alert, which was aimed at influencing residential consumption patterns during peak periods; (ii) The Solar water heating and Energy Efficiency Motor Programme, which included a functional website (details of suppliers and other important information) and exhibition stands at major shopping centres; (iii) Two competitions run by Eskom to raise awareness amongst residents and learners in George about the Residential Load Management programme, which proved to be very successful, and (iv)

The Public Innovation Circuit, which was an internet forum for energy efficient idea generation and the sharing of solutions for electricity problems (Eskom Demand Side Management Department, 2008b; Bredenkamp and Atkinson-Hope, 2009, and Davis, 2010).

2.4.3.9   Power Alert

Power Alert is a media communication aimed at reducing the electricity consumption by residents during peak times (Giani, 2009). The Power Alert gauge provides residents with real time data from Eskom's National Control Centre and suggests ways to reduce the consumption (Eskom Holding Limited, 2008). The Power Alert indicates four levels of strain: (i) Green indicates that the consumption level of the electricity is small; (ii) Orange indicates that the electricity supply is under strain; (iii) Red indicates that the electricity supply is under increasing strain, and (iv) Brown indicates the electricity supply is under severe strain, which means that load shedding was in progress (Eskom Demand Side Management Department, 2008b; Bredenkamp and Atkinson-Hope, 2009; Giani, 2009, and Davis, 2010).

2.4.4   Eskom in New Germany

The Eskom area under study is located in New Germany (Appendices 4 and 5). Eskom in New Germany is located in the eastern region of KwaZulu-Natal. It has a staff complement of seven hundred and fifty-eight employees, and is headed by a General Manager with three E-Band Managers who manage the Engineering, Customer Service and Finance Departments. Eskom had embarked on number of Energy Saving programmes at the offices in New Germany. These programmes included: (i) The Energy Efficient Lighting Project; (ii) The CFL Exchange Programme for Employees; (iii) The E-Learning Energy Efficiency Programme, and (iv) The Residential Energy Efficiency Education Programme.

2.4.4.1 The Energy Efficient Lighting Programme

Studies have indicated that electricity for lighting consumes more than 20% of the world's power stations and there was a drive to reduce this consumption (National Energy Efficiency Agency of South Africa, 2008). In South Africa, 21% of electricity is used for lighting by the residential and commercial sector (Botha-Moorlach and Mckuur, 2009, and Davis, 2010). This consumption rate can be reduced by as much as 75% if incandescent light bulbs and fluorescent tubes are replaced with compact fluorescent light (CFL) bulbs and efficient fluorescent tubes (Botha-Moorlach and Mckuur, 2009; Bredenkamp and Atkinson-Hope, 2009, and Davis, 2010). The CFL bulb is beneficial as it: (i) lasts 10 times longer than an incandescent bulb; (ii) reduces the costs for businesses and low income households; (iii) has lower carbon emissions into the environment, and (iv) improves efficiency by 25% (Eskom Corporate Technical Audit Department, 2007). One of Eskom's Billion kWh programmes was replacing old fluorescent tubes with efficient fluorescent lighting in local government, commercial buildings, residential areas and Eskom's offices and sites (National Energy Efficiency Agency of South Africa, 2008; Eskom Demand Side Management Department, 2008b, and Bredenkamp and Atkinson-Hope, 2009).

Eskom contracted Magnet Electrical Supplies to carry out the Energy Efficient Lighting project in the Eastern region of KwaZulu-Natal. Magnol South Coast Ltd was subcontracted by Magnet Electrical Supplies to carry out the installation of the efficient lighting, while Energywise was subcontracted to compile the reports. The existing lighting system at Eskom offices in the Eastern region of KwaZulu-Natal was changed as follows:

- Fluorescent lighting fixtures were replaced with electronic control gears and triphosfor lamps.
- Existing bulkhead lighting and low-bays were replaced with fluorescents or were retrofitted to the existing body luminaries with special long life (20000 hrs) HQI lamp cool white with higher effective ratio.
- Incandescent lamps were replaced with compact fluorescent lamps (CFL).

- Occupancy sensors were used to maximize energy saving.

The total cost of the project was R3 929 941.56. The project was expected to reduce energy costs by about 48%. In the Eskom New Germany region, the existing lighting load was 260.0 kW, which it was projected, would be reduced to 141.4 kW after the implementation of the lighting efficiency initiatives (Barausse, 2008). A similar project took place at 5 Eskom buildings in the Western Cape: all proved to be highly successful and in addition created an awareness for energy efficiency and power conservation with Eskom employees (Mokoena and Qhala, 2010). Mokoena and Qhala (2010) note that support from Top Management was one of the key aspects to the success of the programme.

2.4.4.2   The CFL Exchange Programme for Employees

The Eskom Board approved a budget of R700 per employee in August 2007, in order to improve energy efficiency awareness amongst the employees and to provide them with energy efficiency technologies to use at home. The target was to distribute 200 000 CFLs to Eskom employees in order to achieve a savings of 6 MW. The employees were informed of the programme through pamphlets, posters, stickers, emails and the intranet (Appendix 6). A total of 2 510 staff participated in the Eskom New Germany region (Balram, 2009). At Eskom New Germany, 12 273 CFLs were distributed and 12 262 incandescent bulbs were collected and crushed. The CFL exchange project resulted in an overall demand saving of 7522MW in the weekday evening peak period. This was an over performance of 25% in terms of the project target of 6MW. In addition, the project resulted in an energy savings of 11 304MWh over the six month period from 01/12/2008 to 31/05/2009. The Eskom CFL campaign was a great success, with employees showing their commitment to keeping South African households alight and leading by example in Eskom's quest to a build an energy savings culture in South Africa (Hibberd, 2009 and Mokoena and Qhala, 2010). The CEO at that time (Mr. Jacob Maroga) complimented all employees on their support and participation in the programme. He further added that employees should continue to utilise the use of CFLs and should encourage family and

friends to buy energy efficient products and appliances. Most importantly, he stressed that "The aim was to build an energy efficient and energy savings culture in South Africa and to lead by example" (Balram, 2009: 8).

2.4.4.3 The E-Learning Energy Efficiency Programme

The 2008 E-Learning Energy Efficiency Programme was designed to educate Eskom employees on Energy savings. The programme was in English, *isi*Zulu and Sesotho. Employees could voluntarily participate. The employees accessed the programme via the intranet. The communication channels utilised for the programme included a comic strip on pay slips, the Eskom website, posters and emails that show progress made per business unit (Eskom Integrated Demand Management Department, 2008).

After the programme, employees had to complete a test. The employees who participated were given aerated shower heads, CFL bulbs and geyser blankets as an incentive. The module consisted of information based on Demand Side Management, National Power Alert Messages, Eskom's future plans regarding efficient energy utilisation, Load shedding and Tips on saving energy at home and in the office. In 2008, over 349 staff within KwaZulu-Natal participated in the programme (Eskom Integrated Demand Management Department, 2008).

2.4.4.4 The Residential Energy Efficiency Education Programme

The Residential Energy Efficiency Education Programme, called the 'I can save a WATT' was administered to all Eskom employees within KwaZulu-Natal. Attendance was voluntary. The programme primarily concentrated on efficient technologies within employees' homes. Incentives for attendance included a buyer and household brochure (Appendix 7), CFL bulbs, shower restrictor and lunch. The main aim of the programme was to equip Eskom employees to be ambassadors for the company and to encourage them to switch to efficient technologies. The programme was rolled out between January and March 2010 and cost approximately R100 000 for KwaZulu-Natal. The programme consisted of the following aspects:

- Tariff period: The tariff chart clearly highlighted the peak, standard and off-peak times of electricity consumption.

- Energy labels: This rated the electricity consumption levels of all appliances.

- Efficient residential usage in the kitchen: This provided residents with simple examples and solutions of efficient energy usage within the home.

- Geysers: This programme informed residents about the different types of geysers and the ways one can reduce the loss of energy usage.

- Compact Fluorescent Lamps: This programme helped residents to change their old light bulbs to the current energy saving compact fluorescent lamps.

- Solar Water Heating: The programme also provided attendees with information regarding saving attained from utilising solar water heating and heat pumps. This included information pertaining to the rebates and registered South African Bureau of Standards (SABS) suppliers.

- Heat Pumps: Although the heat pumps required electricity to heat water, they only consumed 1 unit of electricity energy for every 3 units of heating produced. This resulted in a saving of 67% of electrical energy as compared to the conventional electrical element, which has a 1:1 ratio. Although the heat pumps are cheaper than the solar water heating system, Eskom has still not developed any incentives (Eskom Holding Limited, 2010).

2.5   CONCLUSION

This chapter provided an in-depth literature survey of all aspects pertaining to Energy and Environmental Management. The literature clearly shows that Environmental Management both locally and internationally has undergone numerous changes. It was once seen as a costly and insignificant exercise. However, over the years, drastic climate changes have drawn increased attention and concern from people, businesses, industries and government organisations to take responsibility for the environment. These organisations have seen the benefits of including Environmental Management in the planning of their businesses. In some countries, these programmes are fully implemented and operational while in some countries it is still developing. In the literature, one will

notice that South Africa is still in the development and implementation phase but is continuing to improve its responsibility towards the environment.

The literature survey was followed by a review on Energy Management, which forms part of Environmental Management. The review covered Energy Management at local, regional and international levels, clearly highlighting the different stages each country was in terms of Energy Management. The scarcity of resources resulted in people, businesses, public and private organisations in South Africa taking more responsibility for managing the consumption of energy. All South Africans, including businesses and the government, realised that energy is a key driver of social and economic development. The main focus of this chapter was the Energy Management programmes that were implemented in Eskom, particularly in New Germany. The Energy Management programmes allowed for suggestions to improve the current programmes. With sufficient background knowledge, the research was planned and undertaken with the expectation of yielding fruitful results. It is evident from this perspective that this study will assist in improving the current Energy Management programmes in Eskom.

CHAPTER THREE: RESEARCH METHODOLOGY

3.1   INTRODUCTION

This chapter provides an overview of research in general, methods of gathering data and the purpose of quantitative research used in this study. It also offers a description of the research methods applied, the study location, questionnaire design, population and sample, limitations of the study, data collection and methods of data analysis used.

3.2   OBJECTIVES

The overall aim of the research is important as it describes the scope of work. The aim of this research was to determine Eskom employee's perceptions towards Energy Management Programmes. The employees perceptions on these issues were canvassed and they are presented and discussed in the chapters that follow. The objectives assist in achieving the overall aim and provide a guideline during the collection, analysis and interpretation of the data (Van Damme and De Craecker, 2008). The objectives of the study were to determine Eskom employee's perceptions of:

1. The overall Environmental and Energy Management Programmes within Eskom.
2. The Energy Management Programmes implemented within Eskom, New Germany.
3. The support structures for participation in Energy Management Programmes implemented at Eskom, New Germany.
4. The barriers for participation in Energy Management Programmes implemented at Eskom, New Germany.

This research was conducted so that recommendations for an effective implementation of Energy Management Programmes may be provided to Eskom Management.

3.3   QUANTITATIVE RESEARCH

Quantitative research involves the collection, analysis and interpretation of numerical data, which is collected through experiments, surveys or interviews using structured or unstructured questionnaires (Mouton and Marais, 1996; Blumberg, Cooper and Schindler,

2005, and Leedy and Ormrod, 2005). Survey research occurs when the researcher collects data on people's opinions, attitudes or experiences by posing questions to them and then tabulating the answers (Blumberg et al., 2005 and Leedy and Ormrod, 2005). Based on the above, a series of questions was posed to a group of Eskom employees and the responses were then tabulated. The aim of the questions was to learn more about the Eskom employees' perceptions of its Energy Management Programmes. According to Blumberg et al (2005), survey as a primary data collecting approach is efficient and economical, hence its suitability for this research.

3.4 DATA COLLECTION

According to Leedy and Ormrod (2005), the main aim of research is to understand a problem by taking a sample from a large population. Polit and Hungler (1999), and Barnett (2006) argue that a population includes a total group of subjects with a set of characteristics that will be studied. According to Blumberg et al (2005), for the appropriate sample to be selected, the target population first needs to be chosen. The study or sample represents the target population (Barnett, 2006). There are 758 employees (target population) based at Eskom New Germany, and the sample for this research is 84 of the 758 employees.

3.4.1 Sampling

The objectives of the study were useful in selecting the target population. According to Polit and Hungler (1999); Babbie (2005), and Blumberg et al (2005) a sample is a group of respondents which is carefully chosen from a population which is larger. This group of respondents should reflect the characteristics of the entire population. Mugo (2005) defines sampling as a process of selecting an appropriate unit or group of units (e.g. people, organisations) from a particular population (study area), which is representative of the entire population. The following are some of the advantages of sampling (Blumberg et al., 2005 and Master of Business Administration Official, 2010):

- The costs are much lower to taking a sample rather than conducting a census.

- The quality of the study is often better as there is greater accuracy and reliability in the results.
- The collection of the data is much faster than the time taken to conduct a census.

Clearly, the advantages of sampling are far more beneficial than a census. Eskom employs 30 000 staff. The study concentrated on the staff based at the Eskom offices in New Germany.

Barnett (2006) distinguishes sampling as either probability (random) or non-probability (non-random). According to Leedy and Ormrod (2005), probability sampling occurs when each person in a population has a fair and equal chance of being chosen. There are three types of probability sampling: (i) random, (ii) systematic and (iii) stratified. More detail on these follows (Blumberg et al., 2005; Leedy and Ormrod 2005; Barnett, 2006, and Master of Business Administration Official, 2010):

- Simple random sampling – each sample unit is given a number and numbers are selected at random to form the sample. Each sample unit has a fair chance of being chosen.
- Stratified random sampling – a population can be divided into different groups or stratums. A stratrum is a subgroup of a population that possesses at least one common feature e.g. grades of students. From these strata, a random sample is used to select a sufficient number of respondents.
- Systematic random sampling – one unit is chosen on a random basis and then every nth selection from the list of the population is selected e.g. One requires 20 samples from 100 students whose names have been arranged alphabetically. Divide 20 by hundred and one will get 5. Randomly choose any number from 1 to 5. If the number is 4, then selection will start from 4 and thereafter, one will select every 5th name. The major advantage of the systematic random sampling is its simplicity and flexibility.

According to Leedy and Ormrod (2005), in non-probability (non-random) sampling, subjects are selected from a population in a non-random manner. Blumberg et al (2005);

Leedy and Ormrod (2005), and Barnett (2010) describe each of the non-probability methods:

- Convenience sampling – the researcher selects subjects that are readily available (non-random fashion). This is an inexpensive method of acquiring data.
- Quota sampling – representative subsets of a population are selected. From these subsets, an essential number of subjects are chosen.
- Purposive sampling – specific subjects are identified that will give a diverse perspective on the research objectives.
- Snowball sampling – further subjects are found based on referrals from the initial respondents.

Initially, emailing was used to contact all the employees (whole population) based at Eskom New Germany, in a non-random mode. The employees who responded to the emails sent by the Communication Department formed part of the study. Due to the poor response as well as time and financial constraints, convenience sampling was utilised when the printed questionnaire was handed to employees at Eskom New Germany. Anyone who completed the questionnaire formed part of the sample.

3.4.2 Sample Size

The population consisted of the total number of employees at Eskom, New Germany, which was 758 people. The questionnaire was distributed through the Communication Department to all employees at the Eskom New Germany offices. The response rate was poor and after three months, only 25 employees had answered the questionnaire. To remedy the situation, the 50 managers based at Eskom New Germany were requested to distribute the questionnaire to all staff within their business units. Even this approach met with little success as only 25 completed questionnaires were returned after two months. To increase the sample numbers, the questionnaires were physically administered (face to face) to the staff at Eskom New Germany. After much difficulty, 84 employees completed the questionnaire which is about 11% of the total population. According to Babbie and Mouton (2001), a sample size of 30 is adequate for a study to be statistically sound.

3.5 RESEARCH DESIGN AND METHODS

The research design is described as follows (Bryman and Bell, 2003, and Leedy and Ormrod, 2005):

- A scheduled plan of action.
- A guide for selecting the different types of data.
- An outline highlighting the different variables and their associations.
- An agenda with instructions for each activity in the research.

Mouton (2001) defines research design as a guide and manual for the research process. Kombrabail (2009) concurs that it provides the methods and procedures for acquiring the information needed for solving the problem. Kombrabail (2009) listed four stages that are involved in planning the research design:

1) Find out the amount of work that is needed for the project. The researcher will need to determine (i) the problem, (ii) the relevant information, (iii) the data to collect (iv) how to analyse the data.
2) Determine cost implications.
3) Prepare a time-table, and
4) Verify the results.

The most common research methods used for quantitative research are: (i) Experimental (ii) Exploratory (iii) Quasi Experiment and (iv) Descriptive (Master of Business Administration Official, 2010). A Descriptive Method was used for the study. Gay and Airasian (2003) state that this method involves acquiring information (attitudes, perceptions, opinions etc.) about one or more groups by posing questions to them and then tabulating responses. A series of questions was posed to Eskom employees and the responses were summarised. Inferential statistics were used to formulate an overall understanding of the Eskom employees' perceptions towards the Energy Management Programmes.

3.5.1 Construction of the Research Instrument

A questionnaire was developed and used as the research instrument for collecting data. According to Mouton (2001), the following common errors that occur when designing a questionnaire should be avoided:

- Usage of ambiguous words.
- Combination of questions.
- Disorderly arrangement of questions.
- Utilising irrelevant questions.
- Poor layout of the questionnaire.
- Usage of sensitive or threatening questions.

The above guidelines were taken into account when the questionnaire was developed (Appendix 2). There are two types of questionnaires: (i) interview-administered questionnaires, and (ii) the self-administered questionnaires (Struwig and Stead, 2001). Blumberg et al (2005) list some of the advantages of the self-administered questionnaire:

- Allows contact with otherwise inaccessible respondents (e.g. fieldworkers, consultants etc.).
- It is the lowest cost method.
- Requires minimal staff.
- It is more anonymous.
- Allow respondents more time to think about the questions.
- Allows fast access to those that are computer literate.
- Collection of data is much faster.
- Visuals may be utilised.

Based on the above advantages, the self-administered questionnaire approach was used initially. The self-administered questionnaire was accessed via QuestionPro, which is an online survey website. An email was sent out by the Eskom's Communication Department requesting all employees to participate in the study. In the email, a link was attached so that participants could easily access the questionnaire. To increase the sample size, 50 questionnaires were printed and handed to employees to complete at the New Germany offices.

3.5.2 Pretesting, Validation and Reliability

The pretesting of a test instrument is required for the following reasons:

- To find out what the participants reactions are to the questions.
- To find out whether the participants understand the meaning of the questions.
- To find out if the questions are arranged correctly in terms of continuity and flow.
- To find out if there are any problems with the skip questions.
- To find out whether the allocated time was sufficient to complete the question (Blumberg et al., 2005).

According to Bryman and Bell (2003), and Blumberg et al (2005), pretesting is the final step to improving the survey results before the questionnaire is administered. The questionnaire was administered to a group of Eskom employees so that changes could be made to the questionnaire if there were any problems. The following aspects of the questionnaire were reviewed to ensure that: (i) the questions were not time consuming; (ii) the questions were unambiguous; (iii) the questions were easily understood, and (iv) they were not invasive. After conducting the pretesting, a few modifications were made:

- The examples of energy and environmental management practices were included.
- Some of the questions were rephrased so that respondents could easily understand them.
- There were some questions that were deleted due to duplication.

According to Blumberg et al (2005), validity refers to the extent to which a test measures what a study wishes to measure. Pretesting ensures that validity of the questionnaire is maintained. According to Polit and Hungler (1999); Blumberg et al (2005), and Barnett (2006) reliability is concerned with the accuracy and precision of the measurement procedure. A measure is reliable only if the results are consistent. Therefore if the same questionnaire is administered to a similar population, the study will yield similar results.

3.6   ANALYSIS OF THE DATA

3.6.1   Data Capturing Methods

QuestionPro was able to collate and arrange the data from the Eskom employees. The advantages of QuestionPro are that it (Norusis, 2010):

- Provides users with helpful features to cater for their specific needs.
- Is on a website that has minimal clutter.
- Is user friendly.
- Is cost effective.
- Is easily and quickly accessible to the respondents.

The QuestionPro programme made it very easy and practical to both capture and organise the data for this research.

A variable is any quality or characteristic in a research investigation that has two or more possible values (Leedy and Ormrod, 2005, and Master of Business Administration Official, 2010). In this study, emphasis was placed on the cause and effect relationships where one variable (the cause or the independent) influences another variable (the effect or the dependent). The data was evaluated based on the two types of variables, which were the independent, and dependent variables.

3.6.2   Independent Variables

According to Leedy and Ormrod (2005), the independent variable (cause) can be directly manipulated by the researcher. The independent variables in the research that related to the Eskom employees' attitudes to Energy Management Programmes were based on the respondents. These issues were used as a basis for categorising the data.:

- Gender
- Age
- Race classification
- Education level
- Employment status
- Employment level

- Field of specialisation

3.6.3 Dependent Variables

A dependent variable can be influenced by an independent variable (Leedy and Ormrod, 2005). For this particular research, the dependent variables evaluated were as follows:

- Attitudes towards Environmental Management practices.
- Attitudes towards Energy Management practices.
- Perceptions of Eskom's role in Environmental and Energy Management programmes.
- Perceptions of Eskom's education and training on Environmental and Energy Management programmes.
- Perceptions of Eskom's motivation to encourage participation in Environmental and Energy Management programmes.
- Perceptions of Eskom's incentives to promote Environmental and Energy Management Programmes.
- Awareness and effectiveness of the Energy Efficient Lighting Project at Eskom offices.
- Awareness and effectiveness of the CFL Exchange Programmes for employees' homes.
- Awareness and effectiveness of the E-Learning Energy Efficiency Programme.
- Awareness and effectiveness of the Residential Energy Education Programme.
- Recommendations to improve attendance and participation by Eskom employees in the Energy Management Programmes.
- Reasons for implementing Energy Management Programmes in other organisations.

The independent and dependent variables are presented in tables or figures in this study.

3.6.4 Analysis and Presentation of Data

Leedy and Ormrod (2005), and Barnet (2010) have listed some of the advantages of utilising various statistical software packages:

- Increased user-friendliness of the software programmes. The results are presented in easy-to-read formats.
- These programmes allow the researcher to utilise a variety of statistical procedures that can handle large data sets and multiple variables.
- The software programmes allow the researcher to test for certain characteristics such as skewness, kurtosis etc.
- Increased speed in organising and representing the data.
- The software programme allows the researcher to easily summarise and display the data in tables, pie charts, bar graphs and other graphics.

Based on these advantages, the collated data from QuestionPro was transferred into SPSS version 19. SPSS is a comprehensive system for analysing data and generating tabulated reports, charts, plot distributions and trends, descriptive statistics and complex statistical analyses (Norusis, 2010). For this study, the quantitative data were presented in tables and figures.

3.7 CONCLUSION

The chapter covered the objectives of the research as they provide an overview of the research methodology. The literature on methodologies and then the methodology used in the study were discussed, including the types of research; the data collection in terms of sampling methods and sample size; the design and methods in terms of the test instrument; pretesting and validation, and the administration of the questionnaire. The final section depicted the data analysis, the data capturing methods, independent and dependent variables and the analysis and presentation of the data. In the next chapter, the quantitative data obtained are illustrated and explained.

CHAPTER FOUR: RESULTS

4.1   INTRODUCTION

In this chapter, the quantitative data is presented. The questionnaire was developed using QuestionPro. The questionnaire was used to collect the data from the respondents. The raw data were transferred to the statistical programme for social sciences (SPSS), version 19. Due to the descriptive nature of the study, the data are presented in the form of figures and tables. This chapter presents the analysis of the questionnaires, aimed at addressing the objectives of the study. The presentation of the data is subdivided into two categories. The first category covers the descriptive statistics of the independent variables in terms of gender, age, race classification, level of education, employment status, employment level and area of specialisation. The second category covers the non-demographic responses (dependent variables).

4.2   DESCRIPTIVE STATISTICS OF INDEPENDENT VARIABLES

The use of descriptive statistics in quantitative research allows the data to be presented in a clear and logical way so that results can be easily interpreted and analysed (Leedy and Ormrod, 2005; Mugo, 2005, and Barnett, 2010). The independent variables included gender, age, race, level of education, employment status, employment level and area of specialisation. It is also important to note that all respondents (100%) had access to computer facilities. This is a very positive impression that Eskom portrays as it ensures that all staff have access to a computer, which in many companies might not always be the case. Eskom is serving as a role model for other companies to ensure that staff is keeping abreast with the new technology. Many of the energy management programmes utilise the Eskom's intranet to advertise them. In addition, some of the energy management programmes such as the E-Learning Energy Efficiency programme required employees to have access to computers.

4.2.1 Independent Variables

The table 4.1 illustrates the demographic data of the respondents.

Table: 4.1: Demographic Data of the Respondents

Description		Percentage
1. Gender	Female	53.6
	Male	46.4
2. Age	Under 20	1.2
	20-29Yrs	22.6
	30-39Yrs	39.3
	40-49Yrs	23.8
	50-59Yrs	13.1
3. Race Group	Black	38.1
	Coloured	3.6
	Indian	36.9
	White	20.2
	Other	1.2
4. Highest Level of Education Achieved	Below Matric	2.4
	Matric	9.5
	Diploma	20.2
	Degree	40.5
	Postgraduate Qualification	27.4
5. Employment Status	Permanent	98.8
	Contract	1.2
6. Level in the Organisation	Non Management	53.6
	Junior Management	31.0
	Middle Management	13.1
	Senior Management	2.4
7. What area does your occupation fall into	Administration	14.3
	Finance	9.5
	Human Resource	16.7
	Marketing and Communications	6.0
	Management	7.1
	Technical	10.7
	Engineer	25.0
	Contractor	1.2
	Other	9.5

4.2.1.1 Gender of Respondents

The data reveal that the sample represented both genders, with 53.6% females and 46.4% males.

4.2.1.2 Age of Respondents

The data illustrate a fair spread of respondents across all selected age categories, with the highest falling in the 30-39 age group (33%), followed by the 40-49 age group (23.8%), the 20-29 age group (22.6%), the 50-59 age group (13.1%), and the lowest falling in the under 20 age group (1.2%).

4.2.1.3 Race Group of Respondents

Respondents who answered the survey represented all the race categories, with the highest falling in the black group (38.1%) followed by the Indian group (36.9%), the white group (20.2%), the coloured group (3.6%) and the lowest falling in the group designated "other" (1.2%).

4.2.1.4 Education Level of Respondents

The majority of the respondents (40.5%) had a degree, followed by 27.4% in the postgraduate category and 20.2% in the diploma category. Only 9% of the respondents had a matric qualification. Finally, 2.4% of the respondents had a qualification below matriculation.

4.2.1.5 Employment Status of Respondents

Some 98.8% of respondents were permanent, while a minor percentage (1.2%) was on contract.

4.2.1.6 Level in Organisation of Respondents

A fair distribution of respondents across all four levels is represented, with over half the percentage (53.6%) falling in the non-management category, followed by the junior management category (31%) and middle management with 13.1%. The lowest percentage

of respondents (2.4%) fell in the senior management category. The majority of respondents (84.6%) that completed the questionnaire were from the operational sector whilst 15.5 % were from the upper management level. This indicates that the upper management were either too busy or not interested in completing the questionnaire.

4.2.1.7 Specialisation of Respondents

The data in appendix 8 reveal that respondents come from all eight levels of specialisations. The majority of respondents (25%) were from the Engineering sector, followed by 16.7% from the Human Resource sector, 14.3% from the Administration sector and 10.7% from the Technical sector. The Finance sector comprised 9.5% of the respondents. The "Other" sector comprised 9.5% of respondents, which was followed by 7.1% of respondents in the Management sector, 6% in the Marketing and Communication sector and the least number (1.2%) in the Contractor sector.

4.3   DECRIPTIVE STATISTICS OF THE DEPENDENT VARIABLES

The analysis in this section is based on the total number of respondents who completed the questionnaires. The results were graphically represented in terms of pie charts, bar graphs and tables. The results provide an analysis of the research objectives, which in turn will achieve the overall aim of the study, namely, 'To determine employees' perceptions of Energy Management Programmes at Eskom New Germany'.

4.3.1 The Respondents' Attitudes Towards Environmental Management

Figure 4.1 represents the response to the question 'How important are environmental management practices (recycling, reduction in pollution, waste minimisation) to you?' Over half the respondents (58.3%) indicated that environmental management was a very important aspect to them, while 36.9% of the respondents felt that it was important. Only a minor percentage (3.6%) stated that it was not important to them and 1.2% did not know. These results are very encouraging as they clearly illustrate that a large percentage of respondents (95.2%) had a positive attitude towards environmental management.
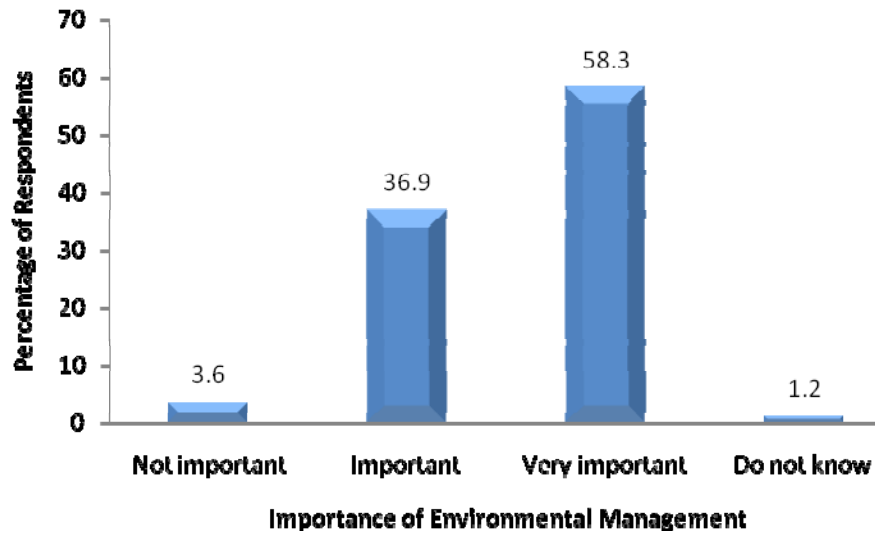
Figure 4.1: Attitudes Towards Environmental Management

4.3.2 The Respondents' Attitudes Towards Energy Management
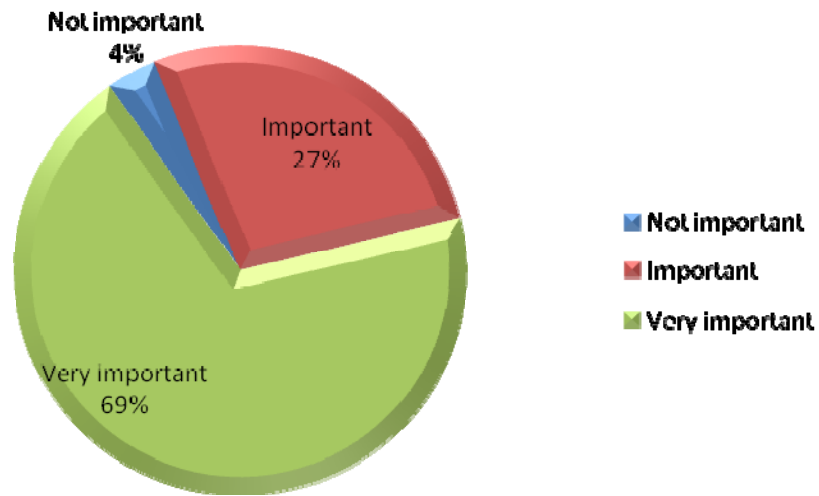
Figure 4.2: Attitudes Towards Energy Management

Figure 4.2 represents the response to the question 'How important are energy management practices (use of fluorescent lights, solar water heating, switching lights and computers when not in use) to you?' In total, over 96% of the respondents had a positive attitude towards energy management. The respondents felt that energy management was either important (27%) or very important (69%) to them. This is very encouraging as

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respondents have the necessary attitude for implementing energy management programmes. Only a minor portion of the respondents (4%) felt that energy management was not very important.

4.3.3 The Respondent's Perception Towards Eskom's Role in Environmental and Energy Management Programmes
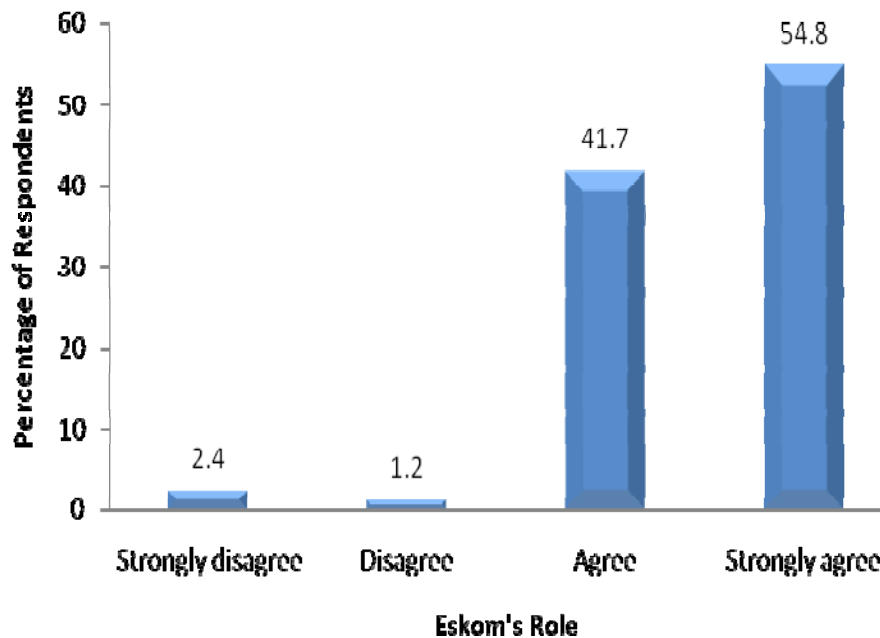
Figure 4.3: Perceptions of Eskom's Role in Environmental and Energy Management Programmes

Figure 4.3 is the graphical representation of the response to the statement 'My company is a strong facilitator of both environmental and energy management programmes'. The majority of respondents (96.5%) felt that Eskom was a strong facilitator of both environmental and energy management programmes. Only a minor proportion of respondents (3.6%) felt that Eskom was not a strong facilitator of both environmental and energy management programmes.

4.3.4 The Respondents' Perceptions of Eskom's Communication Levels
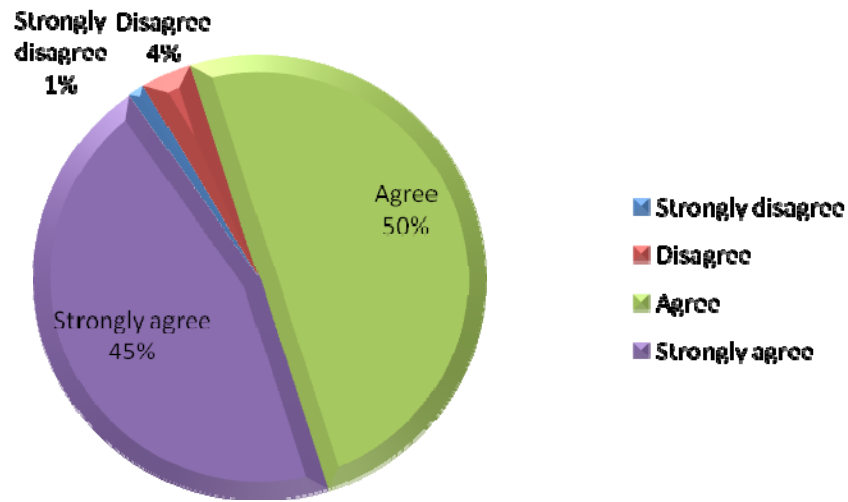
Figure 4.4: Levels of Communication

Figure 4.4 is the graphical representation of the response to the statement 'My company promotes open communication for both environmental and energy management issues amongst employees'. The pie chart clearly indicates that the majority of the respondents (95%) felt that Eskom promoted open communication on environmental and energy management issues amongst employees, while a minor proportion (5%) disagreed with this statement.

4.3.5 Eskom's Environmental and Energy Management Educational Programmes

Figure 4.5 represents the response to the question 'How would you rate the educational programmes for both environmental and energy management issues in the company?" A high percentage of respondents (97.6%) rated the educational programmes from average (14.3%), to good (64.3%) and excellent (19%). A minor proportion (2.4%) rated the training and education as poor
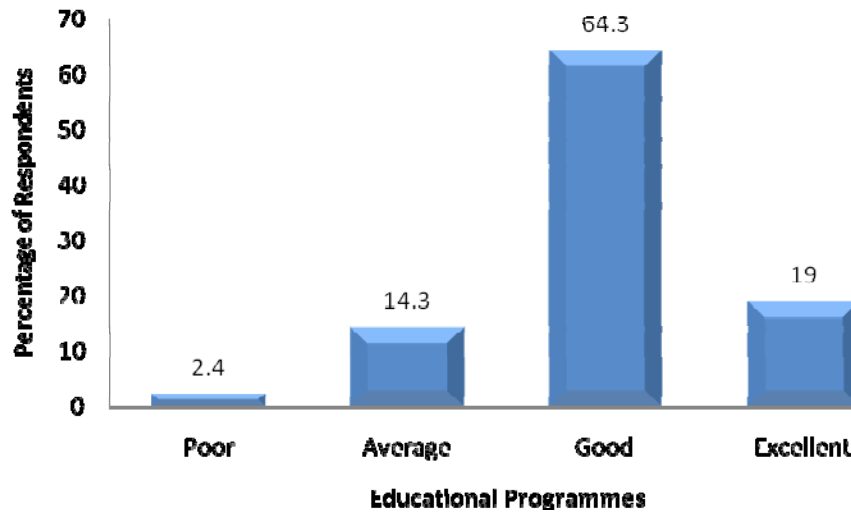
Figure 4.5: Rating of Eskom's Environmental and Energy Management Educational Programmes

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4.3.6 Motivation to Encourage Employee Participation in both the Environmental and Energy Management Programmes
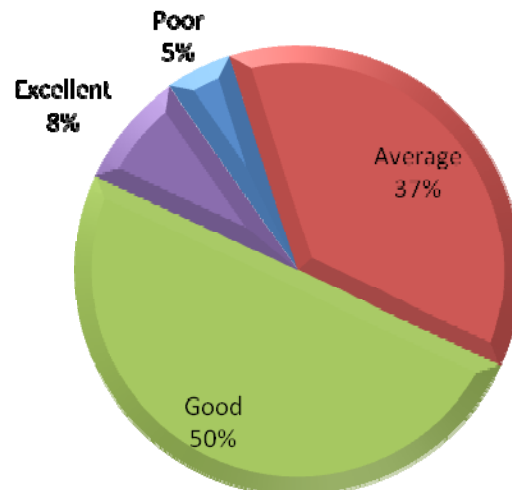
Figure 4.6: Rating of Eskom's Motivation for Employee Participation

Figure 4.6 represents the response to the question 'How would you rate the motivation for employee participation in both environmental and energy management programmes at the company?" Over half the respondents (95%) felt that Eskom motivated its employees

to participate in the environmental and energy management programmes. The results ranged from excellent (8%), to good (50%) to average (37%) and finally, poor (5%).

4.3.7 Incentives to Encourage Employee Participation in both the Environmental and Energy Management Programmes
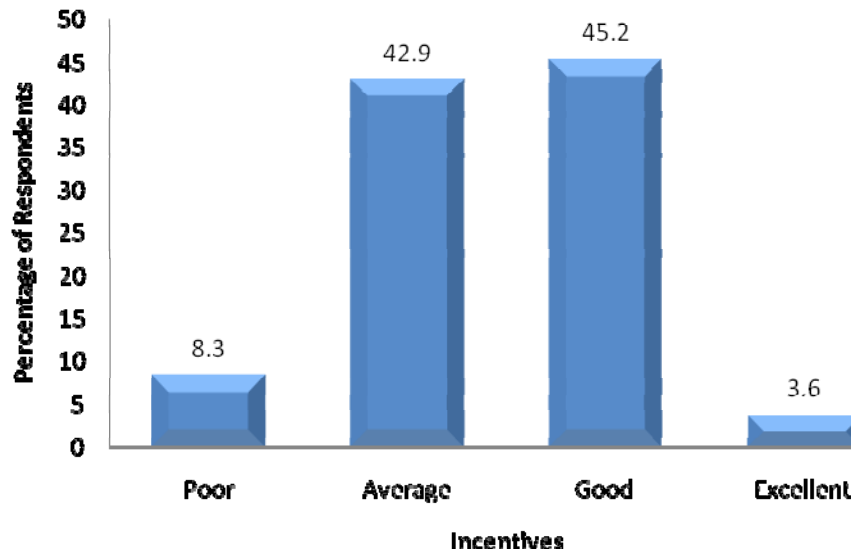
Figure 4.7: Rating of Eskom's Incentives to Encourage Employee Participation

Figure 4.7 represents the response to the question 'How would you rate the incentives for employee participation in both environmental and energy management programmes at the company?' The majority of respondents (91.7%) felt that Eskom's incentives encouraged employee participation for both the environmental and energy management programmes.

4.3.8 Awareness of Eskom's Energy Management Programmes

Figure 4.8 represents the response to the question 'How have you heard about some of the energy management programmes implemented at Eskom, New Germany?' The data shows a fair distribution of awareness amongst the respondents, with the lowest being the line manager (5%) and the highest being Eskom's intranet (29%).
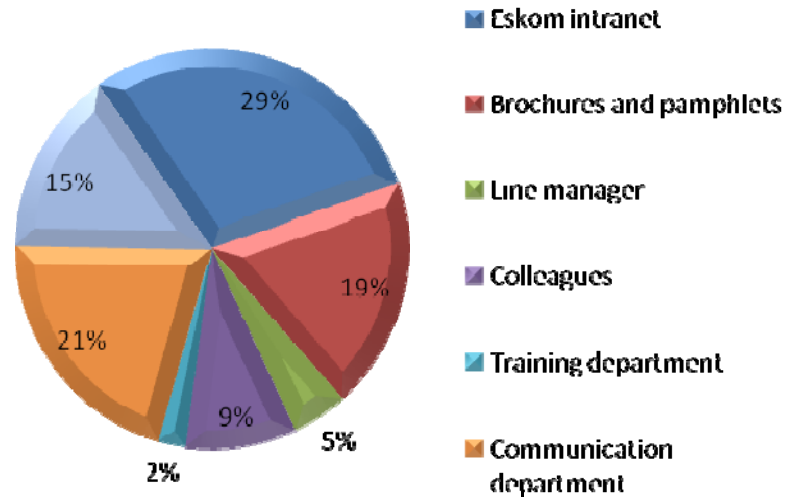
Figure 4.8: Communication Media

4.3.9 Awareness of the Energy Efficiency Lighting Project at Eskom
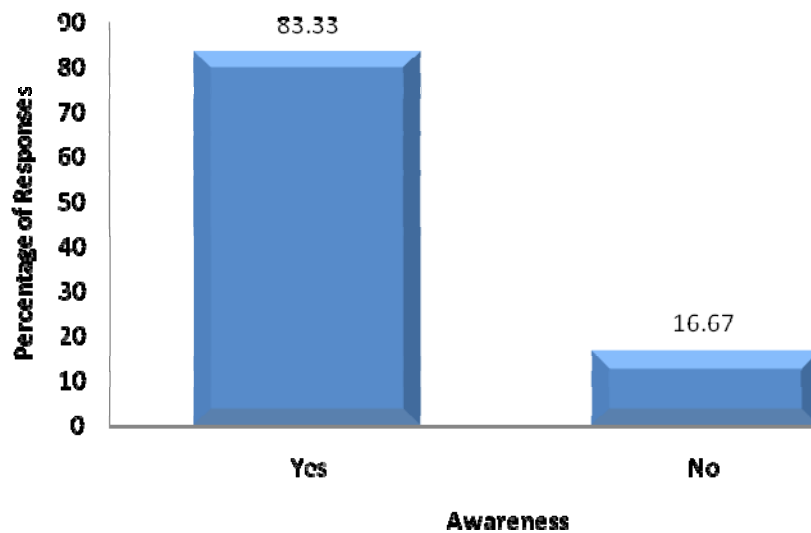
Figure 4.9: Awareness of Eskom's Energy Efficient Lighting Project

Figure 4.9 represents the response to the question 'How did you hear about the Energy Efficiency Lighting Project at Eskom offices?' The data illustrated that majority of the respondents (83.33%) were aware of the energy efficiency lighting project carried out at the Eskom New Germany offices, while only a small proportion (16.67%) were unaware.

4.3.10 Evaluation of Eskom's Energy Efficient Lighting Project

Figure 4.10 is a graphical representation of the response to the question 'How would you rate the Energy Efficient Lighting Project at Eskom offices?" The total percentage of respondents (83.3%) who were aware of the energy efficient lighting project rated the project positively, ranging from excellent (21%), to good (62%) and finally, average (17%).
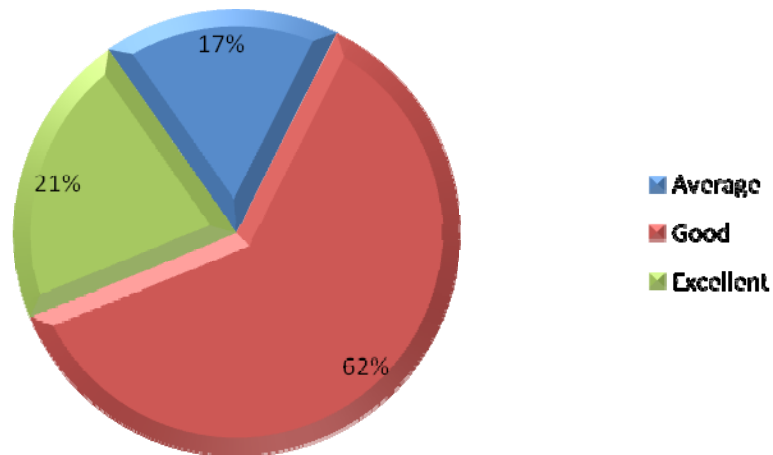
Figure 4.10: Rating of Eskom's Energy Efficient Lighting Project

4.3.11 Amount of Electricity Saved by Eskom
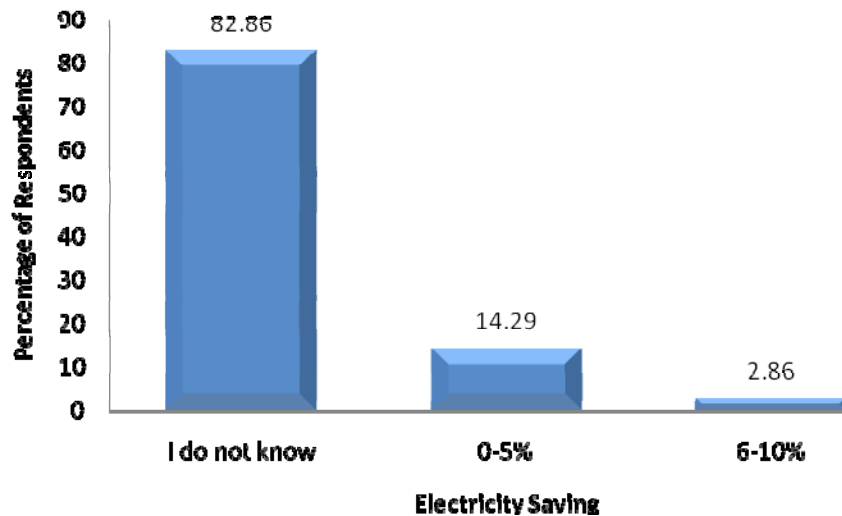
Figure 4.11: Eskom's Electricity Saving

Figure 4.11 is a graphical representation of the response to the question 'To what extent has the Energy Efficient Lighting project reduced the energy consumption within Eskom?' Over half of the respondents (82.86%) did not know the amount of saving that Eskom incurred.

4.3.12 Participation in the CFL Exchange Programme

Figure 4.12 represents the response to the question 'Have you participated in the CFL Exchange Programme for employee's homes?' The majority of respondents (80%) participated in the CFL Exchange Programme, while only a minor percentage (20%) did not participate.
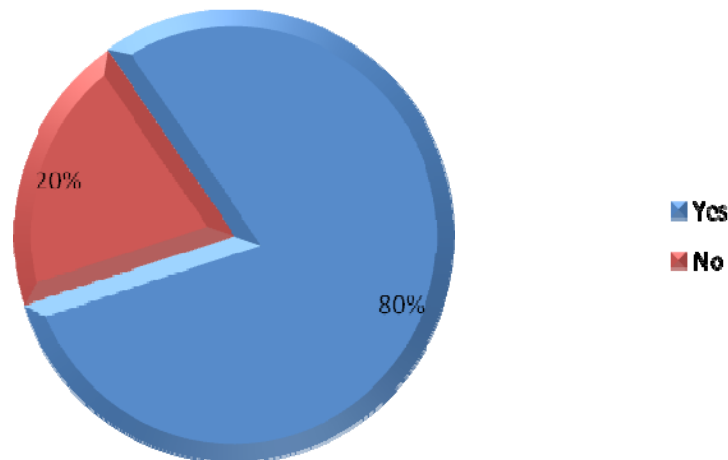
Figure 4.12: Participation in the CFL Exchange Programme

4.3.13 Evaluation of the CFL Exchange Programme

Figure 4.13 is the graphical representation of the response to the question 'How would you rate the CFL Exchange Programme for employee's homes?" The majority of the respondents (70.15%) rated the programme in a positive light (good and excellent) and 29.85% of respondents rated the programme as average
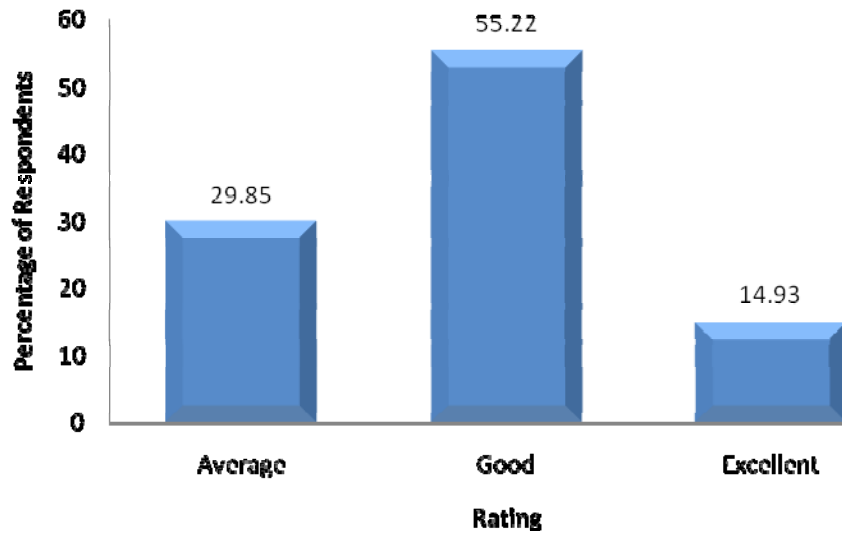
Figure 4.13: Rating of the CFL Exchange Programme

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4.3.14 Amount of Electricity Saved by Respondents
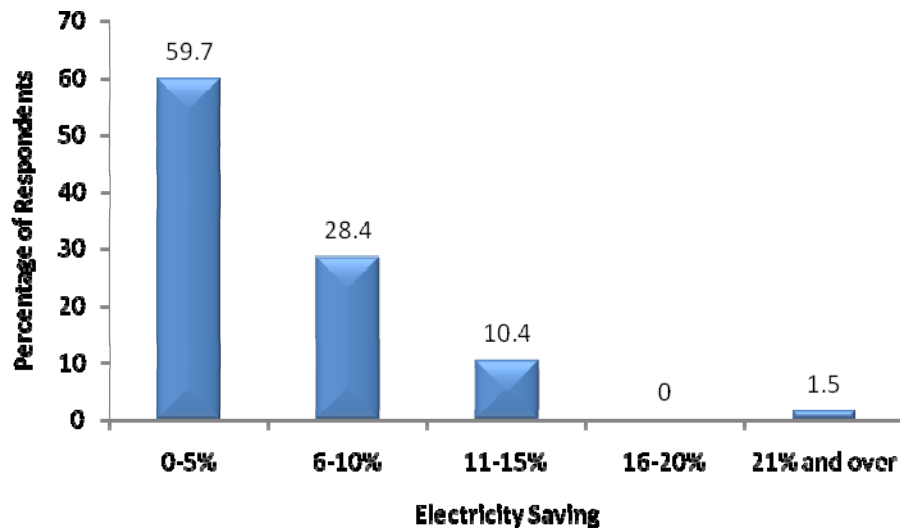
Figure 4.14: Reduction of Energy Consumption

Figure 4.14 is the response to the question 'To what extent has the CFL Exchange Programme reduced the energy consumption within your home?' All the respondents felt that the programme contributed to the reduction of energy consumption within their home.

4.3.15 Non-Participation in the CFL Exchange Programme

Figure 4.15 illustrates the response to the question 'Why did you not participate in the CFL Exchange Programme for the employee's home?' From the 20% of respondents who did not participate in the CFL Exchange Programme, the majority felt that the programme was not beneficial (83%), while 17% were not aware of the programme.
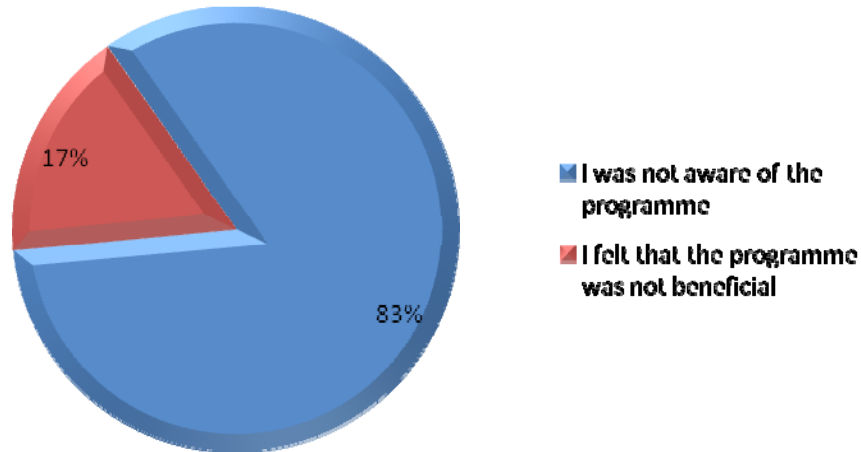
Figure 4.15: Reasons for Non-Participation in the CFL Exchange Programme

4.3.16 Participation in the E-Learning Energy Efficiency Programme
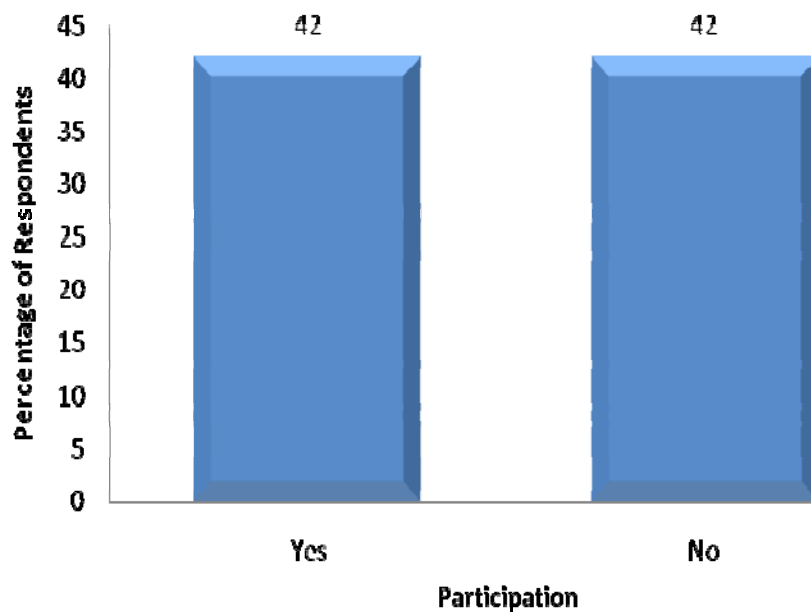
Figure 4.16: Level of Participation in the E-Learning Energy Efficiency Programme

63

Figure 4.16 reflects the response to the question 'Have you participated in the E-learning Energy Efficiency Programme?' The data indicates an equal distribution of respondents (50%) in terms of participation in the E-learning Energy Efficiency programme.

4.3.17 Reasons for Participation in the E-Learning Energy Efficiency Programme

Figure 4.17 contains the response to the question 'Why did you participate in the E-learning Energy Efficiency Programme?' There was a fair distribution of reasons for respondent's participation in the programme with the highest percentage of 35.94%, reflecting those who felt that the programme was beneficial, with the lowest percentage was 12.5 % (the programme was compulsory).
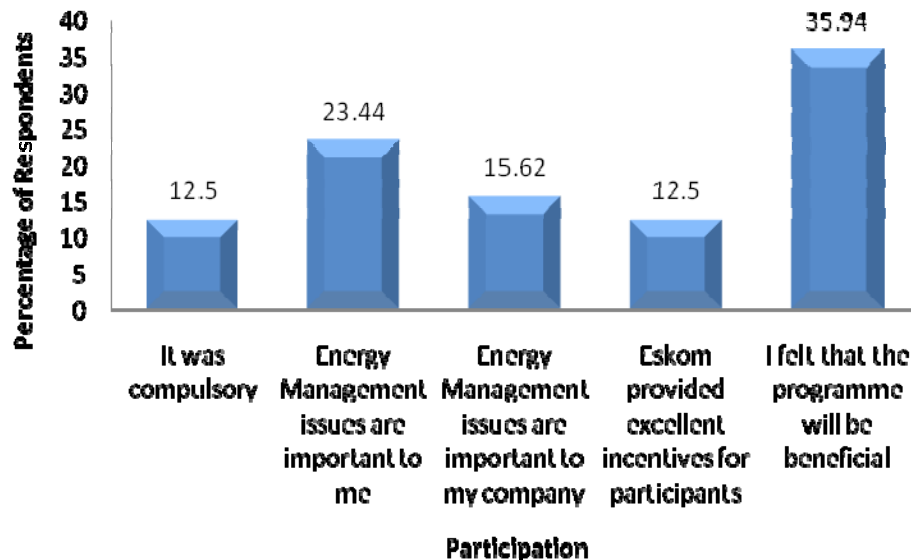
Figure 4.17: Reasons for Participation in the E-Learning Efficiency Programme

4.3.18 Effectiveness of the E-learning Energy Efficiency Programme

Figure 4.18 is the graphical representation of the response to the question 'How effective was the E-Learning Energy Efficiency Programme?' The majority of the respondents felt that the E-Learning module was either effective (85.71%) or very effective (9.52%) in terms of energy management issues. A small percentage of respondents (4.76%) felt that the module was ineffective.
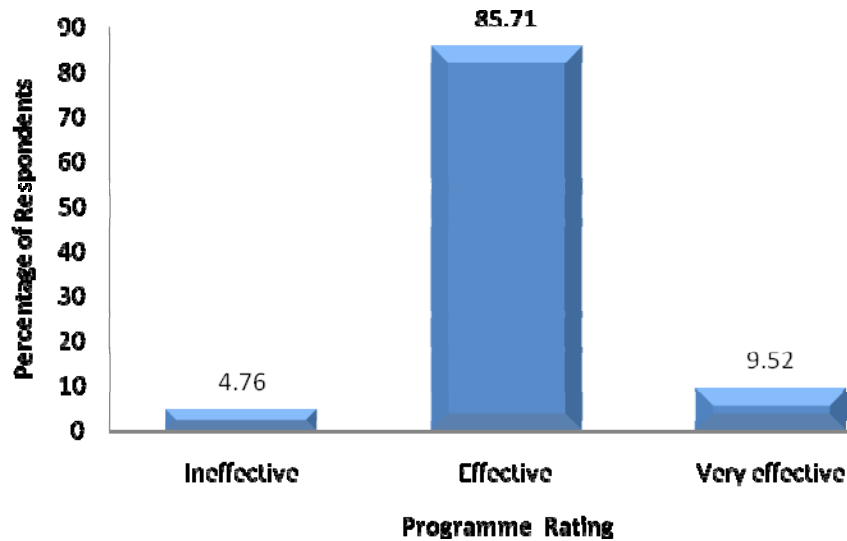
Figure 4.18: Effectiveness of the E-Learning Energy Efficiency Programme

4.3.19 Non-Participation in the E-Learning Energy Efficiency Programme
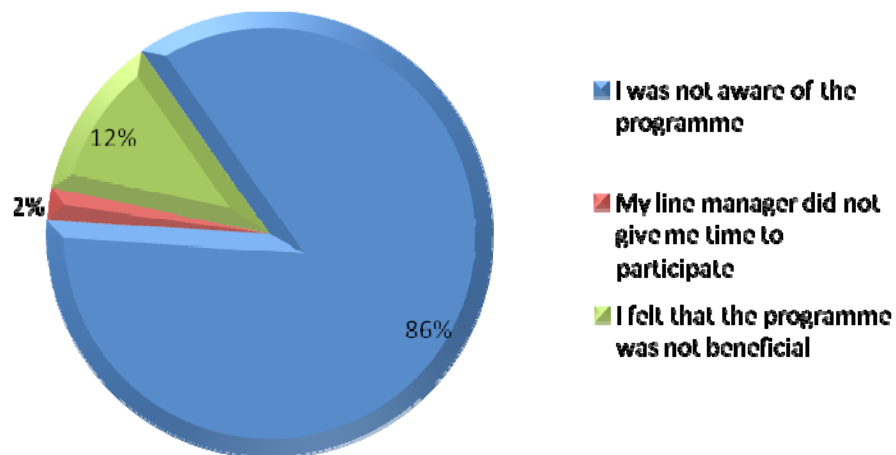
Figure 4.19: Reasons for Non-Participation in the E-Learning Energy Efficiency Programme

Figure 4.19 represents the response to the question 'Why did you not participate in the E-Learning Energy Efficiency Programme?' From the 42 respondents (50%) who did not participate in the E-Learning Energy Efficiency Programme, 12% felt that the programme was not beneficial, 2% stated that their line managers did not give them time to participate and 86% were not aware of the programme.

4.3.20 Eskom Actions to Encourage Attendance in the E-Learning Energy Efficiency Programme

Table 4.2 represents the response to the question 'How can Eskom improve the attendance and participation in the E-Learning Energy Efficiency Programme?' The data illustrate a fair spread of respondents in terms of the recommendations to encourage attendance and participation in the E-learning Energy Efficiency Programme. The highest percentage of respondents (23.76%) felt that the programme should be actively advertised in Eskom, while the lowest percentage of respondents (2.48%) felt that the programme duration should be increased.

Table 4.2: Recommendations to Encourage Attendance in the E-Learning Energy Efficiency Programme

Recommendations	Percentage
All employees should be allowed to attend	8.91
Attendance should be compulsory	20.30
Provide better incentives	10.98
Actively advertise the programme within the company	23.76
Line Managers should actively promote the attendance	22.77
Attendance should be recorded as part of the employees performance management	10.89
Increase the duration of the programme	2.48

4.3.21 Participation in the Residential Energy Efficiency Education Programme

Figure 4.20 illustrates the response to the question 'Have you participated in the Residential Energy Efficiency Education Programme?' The majority of the respondents (62%) did not participate in the programme, while 38% of respondents did participate.
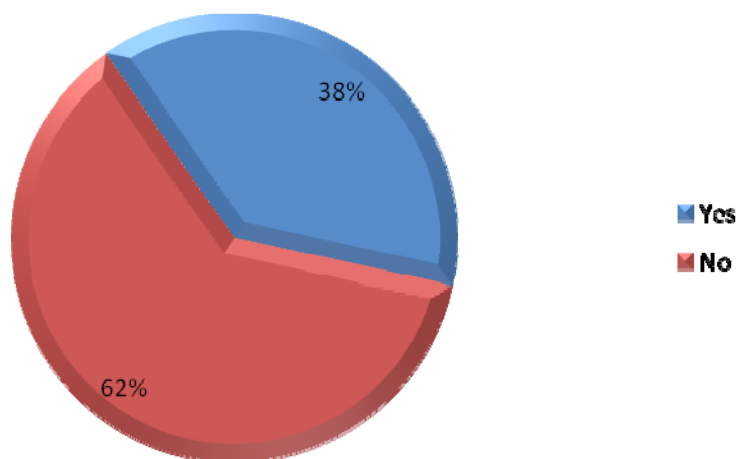
Figure 4.20: Participation in the Residential Energy Efficiency Education Programme

4.3.22 Reasons for Participating in the Residential Energy Efficiency Education Programme

Table 4.3: Reasons for Participation in the Residential Energy Efficiency Education Programme

Reasons	Percentage
It was compulsory	4
All staff in my section were attending	2
Energy management issues are important to me	36
Energy management issues are important to my company	18
Eskom provides excellent incentives	2
I felt that the programme will be beneficial	38

Table 4.3 represents respondents view on the question 'Why did you participate in the Residential Energy Efficiency Education Programme?' From the total number of respondents (38%) that participated in the programme, Table 4.3 illustrates a fair distribution of respondents in terms of the reasons for participating in the programme.

67

4.3.23 Effectiveness of the Residential Energy Efficiency Education Programme

Figure 4.21 shows the responses to the question 'How effective was the Residential Energy Efficiency Programme?' Over half of the respondents (96.88%) felt that the programme was either effective (87.5%) or very effective (9.38%). Only a minor proportion of respondents felt the programme was ineffective (3.12%).
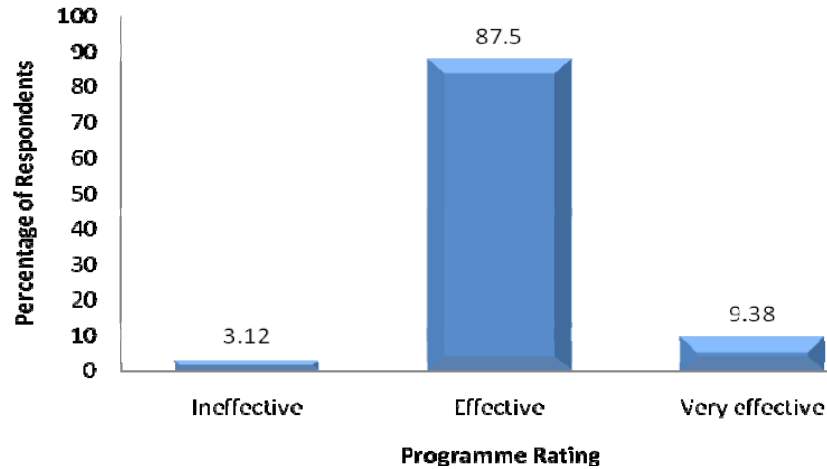
Figure 4.21: Effectiveness of the Residential Energy Efficiency Education Programme

4.3.24 Non-Participation in the Residential Energy Efficiency Education Programme

In Figure 4.22, one can see the graphical representation of the response to the question 'Why did you not participate in the Residential Energy Efficiency Education Programme?' From the 61.90% of respondents who did participate in the programme, the majority of the respondents (88.46%) indicated that they were not aware of the programme. An equal percentage of respondents (1.92%) indicated that their line manager did not give them time to participate and they were not permanent staff members.
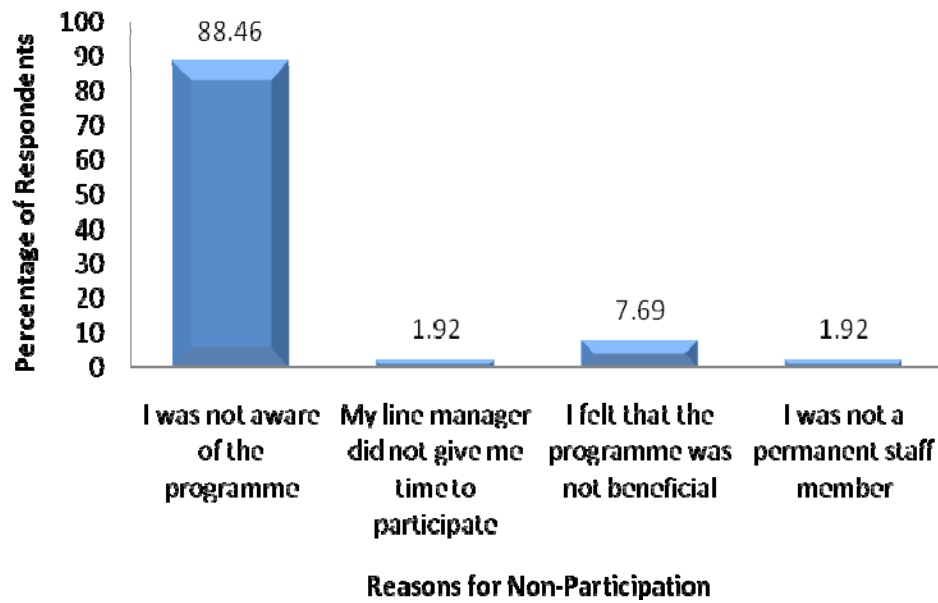
Figure 4.22: Reasons for Non-Participation in the Residential Energy Efficiency Education Programme

4.3.25 Eskom's Actions to Encourage Participation in the Residential Efficiency Education Programme

Table 4.4: Recommendations to Encourage Participation in the Residential Energy Efficiency Education Programme

Recommendations	Percentage
All Eskom staff should be allowed to attend	14.02
Provide better incentives	12.62
Attendance should be compulsory	16.36
Extend the duration of the programme	2.80
Actively advertise the programme	27.10
Line Managers should actively promote attendance.	19.63
Attendance should be recorded as part of the employees performance management	7.47

Table 4.4 represents responses to the question 'How can Eskom improve the attendance and participation in the Residential Energy Efficiency Education Programme?' There is a fair spread of respondents' recommendations in terms of encouraging participation in the Residential Energy Efficiency Education Programme. The highest percentage of respondents (27.10%) felt that the programme should be actively advertised and the lowest percentage of respondents (2.80%) supported the time extension of the programme.

4.3.26 Implementation of Energy Management Programmes
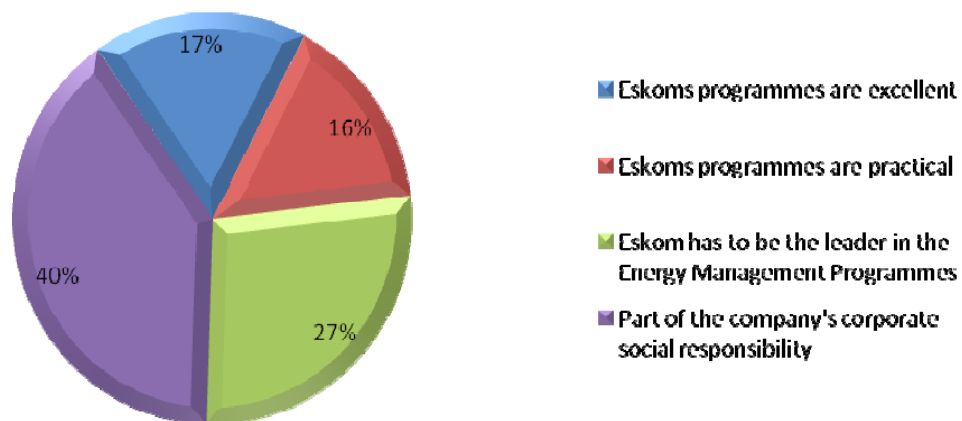
Figure 4.23: Reasons for Implementation of the Energy Management Programmes

All the respondents (100%) felt that Energy Management Programmes should be implemented in other organisations. Figure 4.23 is the graphical representation of the response to the question 'Why do you believe that such Energy Management Programmes should be implemented in other organisations?' The data illustrate a fair spread of respondents in terms of the reasons for implementing the Energy Management Programmes in other organisations. The highest percentage of respondents (39.75%) felt that implementation of such programmes should be seen as the company's corporate social responsibility, followed by 27.33% of respondents who felt that Eskom had to be a role models for other companies.

4.4 CONCLUSION

The characteristics of the participants in terms of their demographic factors such as gender, age, race, education, employment status, employment level and area of specialisation were analysed. The composition of respondents was useful for the analysis and conclusions phase. The descriptive analysis of the dependent variables was carried out. The descriptive outputs from SPSS were explained and illustrated in the form of tables and figures. The explanations and outputs from this chapter are discussed in detail in Chapter Five. The next chapter brings together the findings of the study in relation to the literature survey carried out in Chapter Two.

CHAPTER FIVE: DISCUSSION OF RESULTS

5.1   INTRODUCTION

This chapter deals with the findings obtained and illustrated in chapter four, and explains the research findings in relation to the objectives. The literature review has been drawn into this chapter, particularly when there were correlations between the research findings and the literature on employees' perceptions of energy management programmes.

5.2   DISCUSSION OF QUESTIONS AND OBJECTIVES

5.2.1 Question One: Determine the Respondent's Demographics (age, gender, race, education, occupation and field of specialisation)

This question determined the demographics of the respondents to provide an overview of the respondents. The majority of the respondents were females; however, the difference in the percentage of female to male respondents was negligible. In terms of age, the majority of respondents were in the 30-39 category, followed by the 40-49 category and 20-29 year old group. A small percentage of respondents were in the 50-59 year age group. In terms of education, the majority of the respondents (over 88%) had a post-matriculation qualification. This illustrates that respondents could have the understanding and skills to undertake the energy management programmes offered by Eskom.

The majority of the staff was permanent. Welford (1997); Harding, (2007), and Kreitner and Kinicki (2007) state that good working conditions encourage staff to adopt environmental issues within their jobs. Welford (1997); Harding (2007), and Kreitner and Kinicki (2007) add that job security encourages staff to participate in environmental and energy management programmes. Welford (1997) and Pooley (2003) found that uncertainty of employees' future were impediments to environmental cultural change within an organisation. Hence, with the majority of employees being permanent meant that they are more open to the environmental cultural change within the organisation.

There was a cross selection of respondents across all levels within Eskom with most respondents from the non-management category and the smallest percentage being senior management. Researchers (Perron et al., 2006; Weil, 2006, and Capehart et al., 2008) and studies (Action Energy and Carbon Trust, 2004, and Canadian Energy Efficiency Department, 2004) have found that the success of an environmental or energy management programme is dependent on the involvement of the employer and employees during the development, implementation and follow-up stages. In addition, according to Stone (2000); Pooley (2003); Weil (2006); Harding (2007); Kreitner and Kinicki (2007), and Capehart et al (2008) state that commitment from senior management and employers is essential for environmental cultural change to take place within an organisation. This composition of respondents provided valuable information regarding the energy management programmes.

There was a fair distribution of respondents across all areas of specialisation, with Engineering being the highest composition. This composition of Engineers from the respondents is in keeping with the core business of Eskom, which is to provide electricity. This means that Eskom's core business, which is electricity generation, transmission, and distribution (Eskom Demand Side Management Department, 2008a), is in line with the employment of staff.

5.2.2 Question Two: Determine the Respondents' Attitudes towards Environmental Management

This objective was imperative to determine as the respondents attitudes impact on the success of implementing environmental programmes within Eskom. The majority of respondents (over 95%) indicated that environmental management was important to them. This clearly indicates that the most of the respondents will be more supportive of environmental management programmes within Eskom. Welford (1997) and Pooley (2003) state that contradictory goals can become problematic when employees have different opinions regarding environmental issues from the employers. Stone (2000); Pooley (2004); Weil (2006); Harding (2007) and Kreitner and Kinicki (2007) also argue

that commitment from management and employers are essential for an effective implementation of environmental change. Therefore, the positive attitudes displayed by the majority of respondents were in line with Eskom's environmental commitment. Eskom is committed to providing education and training on environmental issues to the employees, and employees are encouraged to communicate on environmental matters (Sutton, 2008). Fernandez et al (2003) also found that companies that implemented environmental programmes were able to attract, motivate and retain skilled employees. Fernandez et al (2003) further state that environmental programmes are more likely to succeed if the employer gains the understanding and support from employees. Therefore, the attitudes portrayed by the majority of respondents are favourable for the implementation of environmental programmes.

5.2.3 Question Three: Determine the Respondents' Attitudes towards Energy Management

This objective was important, as it was necessary to determine respondent's attitudes as they impact on the success of implementing energy management programmes within Eskom. The majority of the respondents (96%), indicated a positive attitude towards energy management. The main focus of the study was to determine employees' perceptions towards energy management programmes within Eskom. Employee attitudes towards energy management are essential for the success of energy management programmes: as most employees display enthusiasm for the energy management, the programmes are less likely to have setbacks. Studies (Action Energy and Carbon Trust, 2004, and Canadian Energy Efficiency Department, 2004) have shown that the overall success of energy efficiency programmes depends on the co-operation, acceptance and involvement of all within the organisation. Given the positive attitude portrayed by the majority of the respondents, the energy management programmes within Eskom are likely to succeed.

5.2.4 Objective One: Determine the Respondents' Perceptions of Eskom's Overall Environmental and Energy Management Programmes

This objective was to determine the employees' perceptions of Eskom's overall Environmental and Energy Management programmes. This was done by establishing the following information:

- The support structures to promote both environmental and energy management programmes.

- The communication channels to promote both environmental and energy management programmes.

- The educational programmes for environmental and energy management programmes.

- The motivation of employee participation for both the environmental and energy management programmes.

- The incentives of employees' participation for both the environmental and energy management programmes.

A United Kingdom report stated that employees felt that their organisations needed to provide the foundation and support for environmental and energy management programmes to be successful (Energy Management Research Department, United Kingdom, 2009). The commitment by management must be visible to all employees in order for environmental programmes to be successful (Action Energy and Carbon Trust, 2004, and Canadian Energy Efficiency Department, 2004). Welford (1997); Action Energy and Carbon Trust, (2004); Canadian Energy Efficiency Department (2004); Weil (2006); Harding (2007); Kreitner and Kinicki (2007), and Capehart et al (2008) also state that commitment from top management was imperative for the effective implementation and operation of energy management programmes. If an environmental programme is not supported by top management, the programme is likely to fail (Welford, 1997; Stone, 2000, and Pooley, 2003). The majority of the respondents (96.5%) felt that Eskom supported and facilitated environmental and energy management programmes within the organisation. Therefore, the results prove that Eskom is committed to the implementation

and success of environmental and energy management programmes. In addition, Eskom's commitment to environmental goals and a sustainable environment was in the Annual Report and the environmental policy document (Eskom Holding Limited, 2006 and Sutton, 2008). It has also been found that some organisations show their commitment to energy efficiency by developing an energy policy (Action Energy and Carbon Trust, 2004, and Canadian Energy Efficiency Department, 2004). One study found that an energy policy demonstrated the organisation's public commitment to energy efficiency and the environment both internally and externally (Carbon Trust, 2005). Jansson et al (2000) and Linnenluecke and Griffiths (2010) indicate that the top-down approach occurred when top management incorporated the environment in its corporate strategy by establishing an environmental policy, guideline and principles which are then disseminated throughout the organisation. The energy management issues are embedded in Eskom's environmental policy. This clearly illustrates Eskom's commitment to environmental and energy management issues.

The majority of respondents (95%) felt that Eskom promoted open communication for both environmental and energy management issues amongst employees. This is in line with one of the objectives of Eskom's environmental policy, that "Employees and other stakeholders are encouraged to communicate on environmental matters" (Sutton, 2008: 9). Capehart et al (2008) argue that it is important for organisations to promote and encourage positive communication on energy related issues. The Action Energy and Carbon Trust, (2004) and Canadian Energy Efficiency Department (2004) indicate that for the energy management programme to be successfully implemented, the information needs to be communicated to all employees. In addition, Pooley (2003); Stone (2003), and Harding (2007) also suggest that employers must ensure that there is continuous, honest and open communication between employees and themselves. The results illustrate that Eskom promoted open communication on environmental and energy management-related matters.

The majority of the respondents (97.6%) positively rated Eskom's educational programmes on environmental and energy management issues. The results support one of Eskom's environmental policies, which is "to provide education and training on environmental issues to the employees" (Sutton, 2008). Welford (1997); Harding (2007), and Kreitner and Kinicki (2007) found that the implementation of educational and training programmes for all employees assisted in embedding environmental cultures within an organisation. The results indicate that Eskom's environmental and energy management educational programmes encourage an environmental culture within the organisation.

The majority of respondents (95%) agreed that Eskom motivated the employees to participate in the environmental and energy management programmes. According to Weil (2006), employers should use a variety of motivational strategies to inform employees about the energy management programmes. Weil (2006) further states that these motivational strategies will allow employees to become familiar with the programme, thereby encouraging them to participate in training and education. Stone (2000); Pooley (2003), and Harding (2007) indicate that motivation of employees such as joy, respect, acknowledgment and salaries are imperative for an organisation to maintain and implement environmental changes. In addition, the Action Energy and Carbon Trust (2004), and Canadian Energy Efficiency Department (2004) found that management can show their commitment to energy programmes by acknowledging employees' efforts in newsletter article or during performance appraisals. Respondents have agreed that Eskom strongly motivated the employees, which would inevitably result in increased participation in the programmes.

The majority of respondents (91.7%) felt that Eskom provided employees with incentives (ranging from average to excellent) to participate in the environmental and energy management programmes. Carbon Trust (2005) and Weil (2006) note that the key to a successful programme is to identify a variety of incentives which would appeal to the employees. Weil (2006) also found that through the usage of personal and group

incentives, a larger number of employees were inclined to participate in energy awareness programmes. Welford (1997); Harding (2007), and Kreitner and Kinicki (2007) emphasise that the introduction and implementation of incentives are imperative for successfully implementing environmental cultures within the organisations. Studies have also found that incentives increased the participation of employees in the energy management programmes within a business (Carbon Trust, 2005 and United States Energy Efficiency Department, 2007). One study clearly stated that the implementation of incentives was useful for reinforcing employee efforts, resulting in a more energy efficient usage (Weil, 2006). The majority of respondents felt that Eskom provided good incentives which in turn will result in increased participation the energy awareness programmes.

Most respondents felt that Eskom provided good environmental and energy management programmes for the employees. A study conducted on employees in the United Kingdom revealed that companies were placing increased importance on energy and environmental programmes (Energy Management Research Department, United Kingdom, 2009). The study further revealed that this positive attitude was evident through the number of education and training programmes that were developed and implemented for employees (Energy Management Research Department, United Kingdom, 2009). Therefore, the results indicated that employees felt that Eskom placed increased importance on environmental and energy management programmes, which is in line with the trends achieved by international companies.

5.2.5 Objective Two: Determine the Effectiveness of the Energy Management Programmes Implemented at Eskom, New Germany

This objective focused on the energy management programmes that were implemented at Eskom's New Germany office. The acquired information would clearly indicate the effectiveness and success of each programme. There were at least four energy management programmes that were rolled out at Eskom New Germany, which included:

- **The Energy Efficient Lighting Project**

- **The CFL Exchange Programme**
- **The E-Learning Energy Efficiency Programme**
- **The Residential Energy Efficiency Education Programme**

The effectiveness of these programmes was determined through a series of questions posed to the respondents. The results were as follows:

a) The Energy Efficient Lighting Project

In South Africa, 21% of electricity is used for lighting by the residential and commercial sector (Botha-Moorlach and Mckuur, 2009, and Davis, 2010). One of Eskom's Billion kWh programmes was about replacing old fluorescent tubes with efficient fluorescent in local government, commercial buildings, residential areas and Eskom's offices and sites (National Energy Efficiency Agency of South Africa, 2008; Van Es, 2008; Eskom Demand Side Management Department, 2008b; Bredenkamp and Atkinson-Hope, 2009, and Mokoena and Qhala, 2010). The Energy Efficient Lighting Project was an example of such a programme, which was implemented at Eskom, New Germany. The total percentage of respondents (83.3%) who were aware of the Energy Efficient Lighting project positively rated the programme. Clearly, the results indicate that the Energy Efficient Lighting project was effective and was in line with Eskom's drive to install 16 million CFLs, one of which was to be rolled out at Eskom offices (National Energy Efficiency Agency of South Africa, 2008; Eskom Demand Side Management Department, 2008b, and Bredenkamp and Atkinson-Hope, 2009). The results are also in line with the CFL project at 5 Eskom buildings in the Western Cape, which proved to be highly successful and in addition created an awareness of energy efficiency and power conservation with Eskom Employees (Mokoena and Qhala, 2010). The results also supported the report that indicated that the CFL programme would be a success and would reduce the loads by up to 141.4 kW (Barausse, 2008). However, one should also note that the majority of respondents (82.86%) were unable to indicate the reduction levels in the electricity consumption within Eskom. These results were fair, as this information would have been difficult for respondents to know. The employees who implemented the programme would have been aware of the reduction levels. These

reduction levels were not publicised to the employees. In future, the reduction levels should be publicized so that employees would see the benefits of the Energy Efficient Lighting project. Studies have also found that the publication of outputs from energy management programmes motivated employees to participate in the programmes (Action Energy and Carbon Trust, 2004; Canadian Energy Efficiency Department, 2004, and Weil, 2006).

b)   The CFL Exchange Programme

A high percentage of respondents (80%) indicated that they participated in the programme. All the respondents who participated in the programme rated the programme from average to excellent. The majority of participants also indicated that the programme assisted in reducing their home electricity consumption. This clearly illustrates that the CFL programme was in fact very effective and was also in keeping with Eskom's drive to install 16 million CFLs to Eskom, corporate and government employees (National Energy Efficiency Agency of South Africa, 2008; Eskom Demand Side Management Department, 2008b, and Bredenkamp and Atkinson-Hope, 2009). The results are also supported by findings, which indicated that the programme resulted in an energy savings of 11304MWh (Balram, 2009). Mokoena and Qhala (2010) stated that the added benefit of this programme in the Western Region was that it created an awareness of energy efficiency and power conservation with Eskom employees. The CEO at the time, Mr. Jacob Maroga, complimented all employees on their support and participation in the programme (Balram, 2009). Hibberd (2009) and Mokoena and Qhala (2010) also stated that the CFL programme was a great success, with employees showing their commitment to keeping the South African households alight and building an energy saving culture. Mr. Maroga also added that "the aim of these programmes was to build an energy efficient and energy saving culture in South Africa and for Eskom to lead by example" (Balram, 2009: 8). This aim to create an energy saving culture within Eskom is one of the ways in ensuring a successful implementation of energy management programmes. Perron et al (2006) argue that in order for environmental programmes to be effective, there is a need for a significant change in the culture of the business. Robbins and

Decenzo (2003) state that an organisation's culture determines the behaviour of employees. Hence Eskom's intention to create an energy saving culture will lead to increased participation in energy management programmes.

c)   The E-learning Energy Efficiency Programme

At least half the respondents (50%) indicated that they participated in the E-Learning Energy Efficiency Programme. From the respondents (50%) who participated in the E-Learning Energy Efficiency Programme, the highest percentage (35.94) of participants felt that the programme would be beneficial; the second highest percentage of participants (23.44) indicated that energy management issues are important to them. Studies and researchers have shown that in order for an environmental culture to be reinforced within an organisation, employers and employees should have the same views about the environmental management (Welford, 1997; Pooley, 2003; Action Energy and Carbon Trust, 2004; Canadian Energy Efficiency Department, 2004, and Weil, 2006). Therefore, the positive attitude shown by the participants for the programme is in line with Eskom's goal, which is to promote an energy saving culture through their energy management programmes. The lowest percentage (12.5) of respondents indicated that the programme was compulsory and Eskom provided excellent incentives. The incentives provided were excellent, and aerated shower heads, CFL bulbs and geyser blankets. Welford (1997); Harding (2007), and Kreitner and Kinicki (2007) state that one of the mechanisms which can assist in embedding cultures such as environmental and energy management is the implementation of incentives. A number of researchers and studies have advocated the usage of incentives to increase participation in environmental and energy management programmes (Action Energy and Carbon Trust, 2004; Canadian Energy Efficiency Department, 2004; Carbon Trust, 2005; Weil, 2006, and United States Energy Efficiency Department, 2007). In addition, the majority of the participants (95.23%) indicated that the programme was either effective or very effective. The results were also supported by Balram's (2009) report, which noted that the programme was effective across the Eastern region. Although only fifty percent of the employees

participated in the programme, the majority of respondents who did participate indicated that the programme was successful.

d)   The Residential Energy Efficiency Education Programme

The majority of the respondents (62%) indicated that they did not participate in this programme. From the percentage of respondents (38%) who did participate in the programme, the majority of respondents indicated that energy management issues was important to them (36%) and that the programme would be beneficial to them (38%). The responses from the participants are in line with the goals of Eskom, which are to promote energy management. The participants also indicated that energy management issues are important to Eskom. As indicated previously, researchers and studies have shown that similar goals between the employer and employees resulted in increased participation in environmental and energy management programmes (Welford, 1997; Pooley, 2003; Action Energy and Carbon Trust, 2004; Canadian Energy Efficiency Department, 2004, and Weil, 2006). Although only a minor percentage of employees participated in the above programme, the majority of participants rated the programme as effective. There were a number of reasons for non-participation, which will be highlighted in the barriers to the programme. Thus, it is important to bear in mind that non-participation does not necessarily mean that the programme was ineffective or unsuccessful.

Based on the results obtained from the respondents who participated in these energy management programmes, it is clear that the programmes were successful. The respondents clearly indicated that they were both educational and effective. It is also important to investigate the reasons for non-participation in the programme, which will highlight the gaps. These gaps can be addressed so that participation in future can be increased to one hundred percent.

5.2.6 Objective Three: Determine the Support Structures that Facilitate Participation in the Energy Management Programmes Implemented at Eskom, New Germany

This objective focused on the support structures that existed during the implementation of the energy management programmes for the employees at Eskom, New Germany. The acquired information would assist Eskom in developing and implementing future energy programmes by increasing utilisation of the recommended support structures. Firstly, it is important to reiterate respondents' perceptions of Eskom's support structures for the overall environmental and energy management programmes:

- The majority of respondents strongly agreed that Eskom provided excellent support structures, facilities (96.5%) and communication channels (95%) for the overall environmental and energy management programmes.
- A high percentage of total respondents (97.6) positively rated the education of the overall environmental and energy management programmes.
- The majority of respondents (95%) indicated that Eskom motivated the employees to participate in the overall environmental and energy management programmes.
- The majority of respondents (91.7%) also indicated that Eskom provided excellent incentives which encouraged employees to participate in the overall environmental and energy management programmes.

These results clearly indicate that Eskom provided excellent support structures in terms of the overall environmental and energy management programmes.

The support structures will be discussed for each of the energy management programmes implemented at Eskom, New Germany. Firstly, it is important to take note of the communication channels utilised for implementing the energy management programmes at Eskom, New Germany. According to Owens and Driffill (2008), communication channels are vital to increase awareness and change people's attitudes towards energy related issues. The three most utilised communication channels were the intranet, communication department and the media (brochures and pamphlets). Balram (2009) also

indicates that that the three most used channels for communicating the energy management programmes were the intranet, communication department and brochures. Piell (2009) found that more staff at the University of Iowa could be reached by utilising the intranet for spreading awareness of energy management initiatives. Studies have also listed the intranet, communication department and brochures as some of the channels utilised to inform employees regarding energy management programmes (Action Energy and Carbon Trust, 2004; Canadian Energy Efficiency Department, 2004, and United States Energy Efficiency Department, 2007). The Energy Efficient Lighting project utilised the intranet and written materials (pamphlets, posters and articles in newsletters) to notify employees of the programme. A high percentage of the respondents (83.33) indicated that they were aware of the programme. This clearly shows that the combination of communication channels was in fact effective in advertising the programme.

Carbon Trust (2005) and Weil (2006) placed more emphasis on written material such as the brochures and posters as the communication channel of creating awareness around the energy management programmes for employees. The CFL Exchange Programme for employees utilised a number of written materials such brochures, pamphlets, stickers, posters and stickers for creating awareness regarding energy management programmes (Appendix 6). A large percentage of respondents (80%) indicated that they participated in the programme. This shows that the communication channels utilised to advertise the CFL Exchange Programme were effective.

The E-Learning Energy Efficiency Programme utilised a combination of communication channels, which included messages on pay slips and Eskom website. Although the programme utilised only two communication channels, 50% of the respondents participated in the programme. From the respondents (50%) who did participate in the programme, the following reasons were cited for their participation:
- The participants in the E-Learning Energy Efficiency Programme felt that the programme would be beneficial (35.94%) and that energy management issues

were important to them (23.44%). In addition, 15.62% of participants indicated that energy management issues were important to Eskom. The favourable attitudes towards the E-Learning Energy Efficiency Programme clearly illustrate that employers and employees had the same goals towards the energy management programmes. Researchers have indicated that environmental and energy management programmes tend to be more effective when employers and employees portray the same goals towards the environment (Welford, 1997; Pooley, 2003; Action Energy and Carbon Trust, 2004, and Canadian Energy Efficiency Department, 2004). Capehart et al (2008) state that it was necessary for the employer and employees to have similar goals regarding energy management programmes for the business. Clearly, Eskom and the respondents have the same view regarding the significance of energy management programmes. This is supported by Eskom's environmental policy: (i) Employees and other stakeholders are encouraged to communicate environmental matters, and (ii) To provide education and training on environmental issues to the employees (Sutton, 2008). In addition, the attitudes portrayed by the employees are also in line with the South African efficient energy strategy, which promote efficient energy practices, and to protect the environment (Eskom Demand Side Management Department, 2008a).

- The respondents indicated that they participated, as the programme was compulsory (12.5%). By making the programmes compulsory, it ensures that all employees are compelled to participate. In order for a programme to be compulsory, the directive must come from Eskom Management. In fact, Mokena and Qhala's (2010) study recommends that the Energy Efficient Lighting System should come from Eskom Management to obtain full support from all employees. Therefore, making the E-Learning Energy Efficiency Programme compulsory might be one way to increase participation rates.

- An equal percentage of respondents (12.5%) indicated that they participated in the programme as Eskom provided excellent incentives. The E-Learning Energy Efficiency Programmes provided participants with incentives, which included

aerated shower heads, CFL bulbs and geyser blankets. The incentives are valuable in terms of costs. In addition, the incentives were products that promoted energy efficiency savings, thereby further saving electricity and emphasising management of energy. Weil (2006) states that incentives, both tangible and intangible, are effective for reinforcing and promoting energy management programmes. Some studies also encourage the usage of incentives such awards, promotional materials (t-shirts, coffee mugs, caps) and energy-saving devices such as energy-efficient light bulbs and aerators (Canadian Energy Efficiency Department, 2004). One study suggested that incentives should be determined by understanding the motivational factors that encourage employees to participate in energy management programmes (United States Energy Efficiency Department, 2007). Another study even suggested that the percentage of saved energy costs should contribute to staff bonuses (Carbon Trust, 2005).

The participation rates for the Residential Energy Efficiency Education Programme were low (38%). However, it is important to review the reasons for employees' participation so that they can inform future development and implementation of energy management programmes. The reasons for participation included:

- The majority of the participants (38%) indicated that the programme would be beneficial. In addition, 36% of the participants stated that energy management issues were important to them. In contrast, 18% of the participants stated that energy management issues were important to Eskom. Researchers and studies have indicated that environmental and energy management programmes tend to be more effective when employers and employees portray the same goals towards the environment (Welford, 1997; Action Energy and Carbon Trust, 2004, and Canadian Energy Efficiency Department, 2004). Clearly, Eskom and the respondents have the same view regarding the significance of energy management programmes. This is supported by Eskom's environmental policy: (i) Employees and other stakeholders are encouraged to communicate environmental matters, and (ii) To provide education and training on environmental issues to the

employees (Sutton, 2008). Attitudes portrayed by the employees are in line with the South African efficient energy strategy, which promotes efficient energy practices to protect the environment (Eskom Demand Side Management Department, 2008a).

- A small percentage of participants indicated that the programme was compulsory (4%), while only 2% indicated that Eskom provided excellent incentives. The incentives included a buyers and household brochure (Appendix 7), CFL bulbs, shower restrictors and lunch (juice and chips). The incentives were energy saving low cost products. One study has shown that low-cost, on-going incentives are more effective in implementing energy management programmes (United States Energy Efficiency Department, 2007). However, for the Residential Energy Efficiency Education Programme, the low-cost incentives were ineffective in increasing participation levels but were effective in increasing the energy saving practices.

5.2.7 Objective Four: Determine the Barriers that Hinder Participation in Energy Management Programmes Implemented at Eskom, New Germany

This objective focused on the barriers that existed during the implementation of the energy management programmes for the employees at Eskom, New Germany. The acquired information would assist Eskom in addressing the barriers so that future energy programmes are more effective. In terms of barriers, each of the programmes indicated different reasons for non-participation.

From the 20% of respondents who did not participate in the CFL Exchange Programme, the majority of non-participants (83%) felt that the programme was not beneficial. Welford (1997) and Pooley (2003) state that pre-conceived ideas about environment can lead to the failure of energy management programmes. The percentage of non-participants in this programme is minimal; however, it is vital to understand the reasons for non-participation so that the future CFL Exchange programmes receive full support and participation from all employees.

The E-Learning Energy Efficiency Programme utilised a combination of communication channels, which included messages on pay slips and the Eskom website. From the 50% of respondents who did not participate in the E-learning Energy Efficiency Programme, 86% indicated that they were not aware of the programme. The results could be attributed to the following factors:

- The programme only utilised two communication channels (payslips and Eskom GroupWise). These channels were not sufficient enough to increase participation.
- The advertisements did not have much information, as those who did not participate

    indicated that the programme would not be beneficial.

From the 61.90% of respondents who did not participate in the Residential Energy Efficiency Education Programme, the majority of the non-participants (88.46%) indicated that they were not aware of the programme. The high percentage of non-participation from the respondents could be attributed to the fact that only one medium of communication (the Communication Department sent out emails to employees informing them of the programme), was utilised by the programme.

Clearly, programme developers need to review the communication channels utilised for the E-learning Energy Efficiency Programme and the Residential Energy Efficiency Education Programme, so that future programmes receive adequate marketing coverage. Waters (1998) and the Canadian Energy Efficiency Department (2004) state that internal and external communications should be established and maintained for a successful implementation of environmental management programmes. Studies have shown that the correct communication channel is a key component in the implementation of energy management programmes (Carbon Trust, 2004 and United States Energy Efficiency Department, 2007). One study even suggests that the existing lines of communication should be first assessed and then modified to suite the objectives of the energy management programme (Canadian Energy Efficiency Department, 2004).

A minor percentage of respondents indicated that their line managers did not give them time to participate in the E-Learning Energy Efficiency Programme (2%) and Residential Energy Efficiency Education Programme (1.92%). Many studies and researchers found that it was imperative for Energy Management programmes to have the support of top management in order for the programmes to be successful (Zhicheng and Porter, 2000; Action Energy and Carbon Trust, 2004; Canadian Energy Efficiency Department, 2004; Weil, 2006; and Capehart et al., 2008, Mokoena and Qhala, 2010). Therefore, managers should give employees sufficient time to attend programmes relating to energy management issues.

5.2.8 Question Four: Recommendations for an Effective Implementation of Energy Management Programmes

There were three energy management programmes that Eskom had rolled out specifically for employees. The recommendations made by the employees for each of the programmes are discussed below.

a)   CFL Exchange Programme for employees

There were two main reasons for twenty percent of non-participation by Eskom employees in the CFL Exchange Programme. Firstly, the respondents felt that the programme was not beneficial and secondly, they were not aware of the programme. Both these reasons can be addressed by increasing the communication channels. The CFL Exchange programme utilised a variety of communication channels but the following lines of communication as suggested by other researchers can also be included:

- Usage of bulletin boards and pay cheque notices (Canadian Energy Efficiency Department, 2004). Inserting energy management news items or messages in payslips is an excellent medium for capitialising on the employee's attention.
- Usage of videotapes, in-house web cast, internal newsletters and local newspapers, foyer displays and information packs for newcomers (United States Energy Efficiency Department, 2007). All the employees are given the internal newsletters via email or soft copies. An entire section can be dedicated to Energy

Management programmes. The usage of exhibitions in foyers or entrances of buildings should also be encouraged so that employees would realise Eskom's commitment to Energy Management. It will also allow employees to view products relating to energy management such as CFL bulbs and aerated shower heads. The running of videos in the foyers will provide employees with visual information on energy management programmes. The usage of local newspapers will show the community Eskom's commitment to energy management. The compilation of energy management information can be used for new employees during their induction training.

- Usage of external experts to deliver talks on energy management programmes (Carbon Trust, 2005). It would be useful to utilise both local and internal experts for workshops on energy management.

- Hosting of energy management events (Weil, 2006). Eskom can host family events where energy management issues such as the CFL programmes are the highlight of the event. This event will be useful as the implementation of the programme will be at the employee's home, thus requiring family members to participate.

b)   E-learning Energy Efficiency Programme

In terms of non-participation in the E-learning Energy Efficiency Programme, a large percentage of respondents (50%) indicated: (i) they were not aware of the programme; (ii) they felt that the programme was not beneficial, and (iii) Managers did not allow employees to participate. This large percentage of non-participation needs to be addressed in order for the programme to gain increased support. The respondents have made the following suggestions to increase participation in the E-Learning Energy Efficiency Programme for employees:

- The majority of respondents (23.76%) indicated that the marketing of the programme should be increased. Studies have shown that communication initiatives are critical to the success of energy awareness programmes within a business (Canadian Energy Efficiency Department, 2004 and Carbon Trust,

2005). The following communication channels suggested by the above studies can be utilised by the E-Learning Energy Efficiency Programme:

- ✓ The usage of display stands across Eskom communal areas. The incentives such as the geyser blankets, aerated shower heads can be displayed so that they can encourage staff to participate in the programme.

- ✓ The usage of internal newsletters can highlight successful participation by each business unit, thereby motivating other business units to undertake the programme.

- ✓ The usage of brochures and pamphlets illustrating the main sections of the programme and the incentives can spread awareness. The current marketing channels did not utilise pamphlets and brochures to convey the message of the programme.

- The respondents indicated that line managers (22.77%) should promote attendance. Further, 20.3% of the respondents indicated that attendance should be compulsory. By making the programme compulsory, line managers would realise that the initiative is a directive from higher management. This will encourage managers in turn to encourage employees to report to them about participation in the programmes. A number of studies have stated that the support from management was imperative for the success of a programme (Zhicheng and Porter, 2000; Action Energy and Carbon Trust, 2004; Canadian Energy Efficiency Department, 2004; Weil, 2006; Capehart et al., 2008, and Mokoena and Qhala, 2010).

- The respondents jointly suggested better incentives (10.98%) and attendance forming part of an employee's performance management (10.98%). The current programme does offer good incentives. Numerous studies (Welford, 1997; Action Energy and Carbon Trust, 2004; Weil, 2006; Harding, 2007; Kreitner and Kinicki, 2007, and United States Energy Efficiency Department) found that incentives were a key aspect for the successful implementation of energy and environmental programmes. Weil (2006) encouraged attendance at energy management

programmes to be utilised during the performance appraisal process for employees.

c)   The Residential Energy Efficiency Education Programme

In terms of the Residential Energy Efficiency Education Programme, over 61.90 % of respondents did not participate due mainly to the lack of awareness about the programme. The participation rate by employees in the programme was extremely poor. A high percentage of respondents (88.46%) indicated that they were unaware of the programme. The programme utilised only the marketing and communication departments to advertise the programme, which explains the poor participation rate. The only form of advertisement utilised by the department was emails sent to the employees informing them of dates of the modules. This is extremely inadequate. The respondents also strongly recommended that the programme should be actively marketed. There are other communication channels suggested by researchers and studies (Action Energy and Carbon Trust, 2004; Carbon Trust, 2005; Weil, 2006, and United States Energy Efficiency Department, 2007) that could be utilised to increase awareness amongst the employees:

- Host display stands at the entrances or communal areas (canteen) advertising the programme, including the products and incentives. Video clips depicting the core areas of the programmes can be aired on projector screens.
- Compile pamphlets listing the aims, objectives and the areas covered in the programme.
- Articles about the programme should be submitted in the internal newsletters. This medium is important for employees who do not have access to computers.
- The programme can have a dedicated webpage on the Eskom website and a link on the training section.
- The compiled brochures can be part of the induction package for new employees.
- Posters and stickers regarding the programme should be placed on the corridors, and on bulletin boards.

- The addition of energy-saving messages and dates about the programme on employee pay slips is a good way of attracting attention.

The respondents (19.63%) indicated that Line Managers should encourage employees to participate in the programme. There should be a weekly departmental meeting that discusses programmes and issues pertaining to energy management such as the Residential Energy Efficiency Education Programme. Capehart et al (2008) found that support from employer including line managers can contribute to the successful implementation of an energy management programme.

Finally, a high percentage of respondents (39.75%) strongly recommended the implementation of energy management programmes as part of a company's corporate social responsibility. This is supported by a number of researchers (Ramus 2002; Van Marrewijk, 2004; Perron et al., 2006; Harding, 2007; Thornton, 2008, and Clarke and Kourie, 2009), who clearly stated that businesses need to take responsibility for the environment. Hurst (2004); Barrows (2005), and Keene and Pullin (2011) state that due to the intensive global awareness on protecting the environment, new concepts such as corporate social responsibility have emerged.

The respondents (27.33%) also felt that Eskom had to be the leader in the Energy Management programmes. Researchers (Balram, 2009; Hibberd, 2009, and Mokoena and Qhala, 2010), including the Eskom's former CEO, Mr. J. Maroga, stated that Eskom's energy efficiency programmes were developed to build an energy saving culture and to lead by example. Perron et al (2006) state that in order for environmental programmes to be effective, there is a need for a significant change in the culture of the business. Robbins and Decenzo (2003) argue that an organisation's culture determines the behaviour of employees. Hence Eskom's intention to create an energy saving culture will lead to increased participation in energy management programmes.

A fair number of respondents indicated that Eskom's programmes were excellent (17.93%) and effective (15.53%). One of the visions of the South African efficient energy strategy is to promote efficient energy practices within companies (Eskom Demand Side Management Department, 2008a). Eskom's environmental policy promotes efficient energy practices through the provision of education and training on all environmental issues to the employees (Sutton, 2008). Cook and Seith (1992); Remmem and Lorentzen (2000), and Sammalisto and Brorson (2008) found that environmental education and training programmes provided employees with tools to effectively protect the environment. It was further found that businesses that did not include environmental training and education were bound to fail (Saunders and McGovern, 1993; Uhloi and Madsen, 2001, and Hillary, 2009). Therefore, similar environmental and energy management programmes should be implemented in all businesses.

5.3   CONCLUSION

In this chapter, the significant findings of the study were discussed in relation to each of the objectives that were identified for this research. The findings were also discussed in relation to the literature that was covered in Chapter Two. An analysis was made of the relations between the current research findings and the local and international literature. The objectives of the study were clearly analysed and explained so that the main aim, which was to ascertain 'Employees' perceptions of Energy Management Programmes at Eskom, New Germany', was achieved.

The next chapter details the conclusions of the study and recommendations for further research on the subject matter. This is undertaken by presenting possible solutions to improving the development and implementation of energy management programmes within Eskom.

CHAPTER SIX: CONCLUSIONS AND RECOMMENDATIONS

6.1   INTRODUCTION

In this chapter, the conclusions arrived at and the recommendations made were drawn from the findings of the quantitative analysis and the literature reviewed in Chapter Two. The main aim of this chapter was to present sound conclusions with regard to the four energy management programmes administered at Eskom, New Germany. Thereafter, recommendations are made to overcome the barriers experienced thereby ensuring the success of future energy management programmes within Eskom. Finally, recommendations for future research are made in this chapter.

6.2   CONCLUSION

This research tested Eskom employees' perceptions regarding the four Eskom Energy Management Programmes (Energy Efficient Lighting Project, CFL Exchange Programme, E-Learning Energy Efficiency Programme and The Residential Efficiency Education Programme). The results assisted with establishing the appropriate channels in developing, implementing and sustaining current and future energy management programmes for employees within Eskom.

6.3   SPECIFIC RECOMMENDATIONS FROM THIS STUDY

In Chapter Five, each research question and objective had been discussed individually, drawing from the literature review and the findings. Due to the overlapping nature of some of the issues, this chapter consists of the conclusion and recommendation relevant to all the objectives and research questions. The following recommendations are made, based on the results of the current study:

- All four programmes were very informative. However, they are administered by different departments. The Demand Side Management Department should be coordinating all aspects of Energy Management Programmes which will be more beneficial in terms of:

- ✓ The reduction of costs for developing and implementing energy management programmes.

- ✓ The effective utilisation of communication channels based on the target audience.

- ✓ There will be one attendance schedule depicting the dates, times and venues that will be distributed to all employees within the Eskom.

- ✓ There will be one data network listing all attendees, thereby assisting if Eskom wished to utilise the information for an employee's performance management.

- ✓ This would allow the department to develop, implement and coordinate new and existing programmes. Currently, proper studies have not been undertaken to determine the effectiveness of each programme. By undertaking such studies, it would help to update and make the Energy Management Programme more effective.

- ✓ It is easier for one central department to apply for funding to administer such energy management programmes. The funding can be applied within Eskom and also from other agencies such as local (government and private sector) and international institutions.

- There were some programmes where a high percentage of respondents indicated that they were unaware of the energy management programmes e.g. The Residential Energy Efficiency Education Programme. By increasing awareness of the programmes, the number of participants would considerably improve.

- The Line Managers should be more supportive to staff by encouraging them to attend these programmes, particularly if attendance is used for performance management. There were some programmes (E-Learning Energy Efficiency Programme) where respondents indicated that their Line Managers did not give them time to attend. In addition, a high percentage of respondents recommended that Line Managers should actively promote attendance at the E-Learning Energy Efficiency (22.77%) and the Residential Energy Efficiency Programmes (19.63%).

- Attendance at these programmes should be part of the employee's performance management. A fair percentage of respondents also recommended that attendance at the energy management programmes is made part of an employee's performance management. By making the programmes part of the employee's performance appraisal, attendance becomes compulsory and line managers will be forced to encourage staff in each business unit to attend.

- The provision of good incentives can also encourage employees to participate in the energy management programmes. The respondents also recommended that better incentives should be provided to encourage attendance to energy management programmes (e.g. 12.62% of respondents suggested better incentives for the Residential Energy Efficiency Programmes). A high percentage of respondents (91.7%) stated that Eskom does in fact provide excellent incentives for the overall Environmental and Energy Management Programmes. Therefore, future programmes should investigate the different types of incentives that would encourage attendance. Incentives can be utilised in two ways: (i) Group incentives occur when departments or groups are acknowledged for their efforts towards energy efficiency, and (ii) Personal incentives occur when individuals are acknowledged on energy efficiency. A combination of personal and group incentives should be utilised in rewarding employees' efforts towards the energy management programmes. There are various kinds of incentives which can be utilised: (i) Material incentives such as novelty items with energy saving messages (mugs, key rings, pens, t-shirts, bags etc.); (ii) Energy saving products (CFL bulbs, geyser blankets, solar water heating systems, etc.); (iii) Awarding of certificates and plaques at special events; (iv) Provision of certain privileges such as special parking for car pools, special hours for those who walk or ride a bicycle, and (v) Publishing photographs of departments or individuals acknowledging their contributions to energy management in internal newsletters, the intranet or website.

- The following communications objectives should be achieved: (i) Employees need to understand the importance of energy management within the organisation;

(ii) Employees need to play a role during the development and implementation stages of the energy management programmes, and (iii) Employees need to understand energy management practices outside the organisation.

- The study has shown that some lines of communication are more effective than others. However, a combination of communication channels should be utilised to reach more employees such as the intranet, website, newsletters, posters, pay-cheque notices, bulletin boards, displays or audio-visual presentations at entrances or hallways, hosting of special energy conservation days, brochures, pamphlets, stickers, competitions or games and guest speakers.

- Combined Energy Management Programmes should be implemented in other organisations.

6.4   RECOMMENDATIONS FOR FUTURE RESEARCH

The following were identified as opportunities for future research on the subject of Energy Management Programmes:

- The study only looked at employees at Eskom, New Germany. Future studies of energy management programmes could be undertaken within Eskom in other regions. The results from each of the studies can be combined to provide Eskom with a stronger Energy Management Programme for employees.

- The study concentrated mainly on employees' perceptions of Eskom's energy management programmes. Future research can be conducted with the employers of Eskom and other organisations.

- Due to limitation of resources, this research was designed to use quantitative analysis. Future research could be undertaken adopting a qualitative approach. Qualitative analysis will not restrict employee's responses. In fact, it will allow them to give their opinions regarding energy management. In some cases, the qualitative analysis might provide better recommendations than those provided by the researcher.

- Due to the limitation of time, only 84 employees were sampled. Future research could be undertaken on a larger sample size.

- The research was limited to Eskom. Future research can be undertaken in other organisations that have developed and implemented energy management programmes.
- In terms of demographics, future research can be undertaken on a more demographically representative sample e.g. a fair number of employees from each area of specialisation, age group and level in the organisation.

6.5   CONCLUSION

The study reveals that Eskom is the leader in terms of its Environmental and Energy Management Programmes. The study clearly illustrates that Eskom's Environmental and Energy Management Programmes were effective. However, the study has pointed out the gaps, which need to be addressed so that the programmes can be more effective and sustainable. The main recommendation is that all Energy Management Programmes should be combined and one Department needs to oversee the development, implementation and follow-up stages. By utilising the combination strategy, there will be one coherent and consistent energy management programme for Eskom, which is properly administered and documented. This will allow developers to build on existing programmes by reviewing and addressing the gaps so that future energy management programmes for employees are even more effective, sustainable and successful.

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APPENDICES

Appendix 1:   Sample Template Requesting Permission to Conduct the Study

UNIVERSITY OF KWAZULU-NATAL

Mr Peter Craig
General Manager
Eskom Eastern Region

24 June 2010

Dear Mr Craig

PERMISSION TO CONDUCT RESEARCH AS PART OF THE MBA QUALIFICATION

It is a requirement of our MBA qualification that all students conduct a practical research project in their final year. **Leena Rajpal** is conducting research entitled **Employee perceptions of Energy Management Programmes at Eskom, New Germany.**
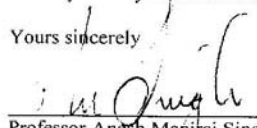
This project will be a practical problem solving exercise which necessitates data gathering by means of questionnaires or interviews.

I would like to request permission for **Leena Rajpal** to conduct the study at your organization for purposes of this research. Please note that as part of the University being a research led institution, the work may be published in an International journal, or as part of the Graduate School of Business working paper series which will be hosted online. Please be assured that all information gained from the research will be treated with the utmost circumspection. In terms of the University's ethics policy, the student will strictly adhere to confidentiality and anonymity of respondents. If you want your company to be reported anonymously in the final published works, we will be glad to oblige.

I would be grateful if you could provide written permission on a company letterhead and signed by the relevant authority.

Thank you for your assistance in this regard.

Yours sincerely

Professor Anesh Maniraj Singh
Head of School
Graduate School of Business

G S B
Westville Campus

Postal Address: Private Bag X54001, Durban, 4000

Telephone: (031) 260 7564   Facsimile : (031) 260 7679   Email: clarkew@ukzn.ac.za   Website www.ukzn.ac.za
Founding Campuses: Edgewood   Howard College   Medical School   Pietermaritzburg   Westville

110

Appendix 2:   Ethical Clearance Approval

UNIVERSITY OF KWAZULU-NATAL
INYUVESI YAKWAZULU-NATALI

Research Office, Govan Mbeki Centre
Westville Campus
Private Bag x54001
DURBAN, 4000
Tel No: +27 31 260 3587
Fax No: +27 31 260 4609
ximbap@ukzn.ac.za

27 March 2012

Ms L Rajpal
Graduate School of Business

Dear Ms Rajpal

ETHICAL APPROVAL NUMBER: HSS/0995/010M
PROTOCOL: Employee perceptions of Energy Management Programmes at Eskom New Germany

In response to your application dated 03 September 2010, Student Number: **9404780** the Humanities & Social Sciences Ethics Committee has considered the abovementioned application and the protocol has been given **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 school/department for a period of 5 years.

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

Yours faithfully

Professor Steve Collings (Chair)
Humanities & Social Sciences Research Ethics Committee

cc Supervisor Mr Alec R Bozas
cc Mrs Wendy Clarke

1910 - 2010
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111

University of KwaZulu-Natal
Graduate School of Business
Voluntary Questionnaire

I, Leena Rajpal am a Masters of Business Administration (MBA) student at the Graduate School of Business of the University of KwaZulu-Natal invite you to participate in a research project entitled Employee perceptions of Energy Management Programmes at Eskom New Germany. The main aim of the study is to determine the effectiveness of The Energy Management Programmes within Eskom. Through your participation I hope to understand i) the nature of Energy Management Programmes within Eskom, (ii) the employee's awareness and attitudes towards these programmes, and (iii) Eskom promotion and communications of these programmes. The results from the study will assist Eskom Demand Side Management to improve the current programmes. The results will also assist other organizations who would be interested in implementing similar Energy Management Programmes. Your participation in this project is voluntary. You may refuse to participate or withdraw from the project at any time with no negative consequence. There is no monetary gain from participating in this survey or focus group. Confidentially and anonymity of records identifying you as a participant will be maintained by the Graduate School of Business, University of KwaZulu-Natal. Your participation is greatly appreciated and will add immense value to the current and future research in Energy Management Programmes.

If you have any questions or concerns about completing the questionnaire or about participating in this study, you may contact me or my supervisor at the numbers listed above. The survey should take you approximately 5 MINUTES to complete. Once again, I want to thank you for taking the time and effort to complete the survey.
Sincerely
Leena Rajpal-031 2607065
Supervisor: Mr. A. Bozas-031 260 7564

1. Gender
    1. Female
    2. Male

2. Age
    1. Under 20
    2. 20-29
    3. 30-39
    4. 40-49
    5. 50-59
    6. 60 and over

3. Race Group
    1. Black
    2. Coloured
    3. Indian
    4. White
    5. Other

4. Highest Level of Education Achieved
    1. Below Matric
    2. Matric
    3. Diploma
    4. Degree
    5. Postgraduate Qualification
    6. Other

5. Employment Status
   1. Permanent
   2. Contract
   3. Casual

6. Level in the Organisation
   1. Non-Management
   2. Junior Management
   3. Middle Management
   4. Senior Management

7. What area does your occupation fall into?
   1. Administration
   2. Finance
   3. Human Resource
   4. Marketing and Communications
   5. Management
   6. Technical
   7. Engineer
   8. Consultant
   9. Contractor
   10. Other

8. Do you have regular access to a computer?
   1. Yes
   2. No

9. How important are Environmental Management practices (recycling, reduction in pollution, waste minimisation) to you?
   1. Not important
   2. Important
   3. Very Important
   4. Do not know

10. How important are Energy Management practices (use of fluorescent lights, solar water heating, switching of lights and computers when not in use) to you?
   1. Not important
   2. Important
   3. Very important
   4. Do not know

11. My company is a strong supporter of both Environmental and Energy Management Programmes
   1. Strongly disagree
   2. Disagree
   3. Agree
   4. Strongly agree

12. My company promotes open communication for both Environmental and Energy Management issues amongst employees.
   1. Strongly disagree
   2. Disagree
   3. Agree
   4. Strongly agree

13. How would you rate the educational programmes for both Environmental and Energy management issues at the company?
    1. Poor
    2. Average
    3. Good
    4. Excellent

14. How would you rate the motivation of employee participation for both Environmental and Energy Management Programmes at the company?
    1. Poor
    2. Average
    3. Good
    4. Excellent

15. How would you rate the incentives of employee participation for both Environmental and Energy Management Programmes at the company?
    1. Poor
    2. Average
    3. Good
    4. Excellent

16. How have you heard about some of the Energy Management Programmes implemented at Eskom, New Germany?
    1. Eskom intranet
    2. Brochure and pamphlets
    3. Line Manager
    4. Colleagues
    5. Training Department
    6. Communication Department
    7. Marketing Department

17. Did you hear about the Energy Efficient Lighting Project at the Eskom offices?
    1. Yes
    2. No

18. How would you rate the Energy Efficient Lighting Project at the Eskom offices?
    1. Poor
    2. Average
    3. Good
    4. Excellent

19. To what extent has the Energy Efficient Lighting Project reduced the energy consumption within Eskom.
    1. I do not know
    2. 0-5%
    3. 6-10%
    4. 11-15%
    5. 16-20%
    6. 21% and over

20. Have you participated in the CFL Exchange Programme for employee's homes?
   1. Yes
    2. No

21. How would you rate the CFL Exchange Programme for employee's homes?
    1. Poor
    2. Average
    3. Good
    4. Excellent

22. To what extent has the CFL Exchange Programme reduced the energy consumption within your home.
    1. I do not know
    2. 0-5%
    3. 6-10%
    4. 11-15%
    5. 16-20%
    6. 21% and over

23. Why did you not participate in the CFL Exchange Programme for the employee's home?
    1. I was not aware of the programme.
    2. My line manager did not give me time to participate.
    3. I felt that the programme was not beneficial.
    4. I am not a permanent staff member

24. Have you participated in the E-learning Energy Efficiency Programme?
    1. Yes
    2. No

25. Why did you participate in the E-Learning Energy Efficiency Programme?
    1. It was compulsory.
    2. Energy Management issues are important to me.
    3. Energy Management issues are important to my company.
    4. Eskom provided excellent incentives for participants.
    5. I felt that programme will be beneficial.

26. How effective was the E-Learning Energy Efficiency Programme?
    1. Very ineffective
    2. Ineffective
    3. Effective
    4. Very effective

27. Why did you not participate in the E-Learning Energy Efficiency Programme?
    1. I was not aware of the programme.
    2. I did not have access to a computer.
    3. My line manager did not give me time to participate.
    4. I felt that the programme was not beneficial.
    5. I am not a permanent staff member.

28. How can Eskom improve the attendance in the E-Learning Energy Efficiency Programme?
    1. All employees should be allowed to attend.
    2. Attendance should be compulsory.
    3. Provide better incentives.
    4. Actively advertise the programme within the company.
    5. Line Managers should actively promote the attendance.
    6. Attendance should be recorded as part of the employee's performance management.
    7. Increase the duration of the programme.

29. Have you participated in the Residential Energy Efficiency Education Programme?
    1. Yes
    2. No

30. Why did you participate in the Residential Energy Efficiency Education Programme?
    1. It was compulsory.
    2. All staff in my section were attending.
    3. Energy Management issues are important to me.
    4. Energy Management issues are important to my company.
    5. Eskom provided excellent incentives.
    6. I felt that the programme will be beneficial

31. How effective was the Residential Energy Efficiency Education Programme?
    1. Very ineffective
    2. Ineffective
    3. Effective
    4. Very effective

32. Why did you not participate in the Residential Energy Efficiency Education Programme?
    1. I was not aware of the programme.
    2. My line manager did not give me time to participate.
    3. I felt that the programme was not beneficial.
    4. I was not a permanent staff member.
    5. The incentives were not valuable.

33. How can Eskom improve the participation in the Residential Energy Efficiency Programmes?
    1. All Eskom staff should be allowed to attend.
    2. Provide better incentives.
    3. Attendance should be compulsory.
    4. Extend the duration of the programme.
    5. Actively advertise the programme.
    6. Line Managers should actively promote the attendance.
    7. Attendance should be recorded as part of the employee's performance management.

34. Do you think that such Energy Management Programmes should be implemented in other organisations?
    1. Yes
    2. No

35. Why do you believe that such Energy Management Programmes should be implemented in other organisations?
    1. Eskom's programmes are excellent.
    2. Eskom's programmes are practical.
    3. Eskom has to be the leader in Energy Management Programmes.
    4. It should be part of every company's corporate social responsibility to implement such programmes.

Appendix 4:   Geographical Location of the Study Area

Source: Eskom Eastern Region: Land Development, Mr. Brian Akkiah

Appendix 5:   Aerial Location of the Study Area
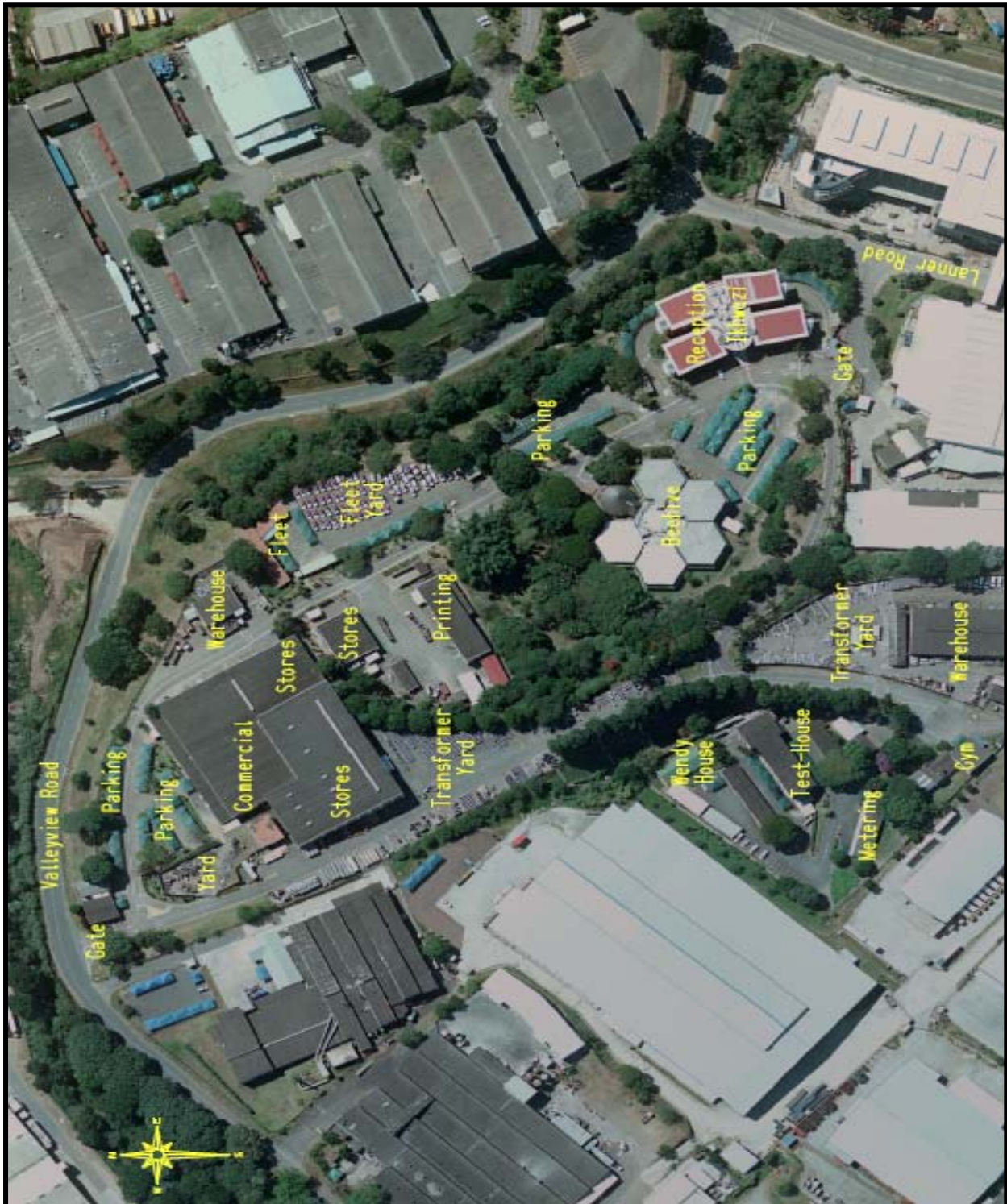
Source: Ethekweni Metro Geographic Information Systems Department, 2011

Appendix 6:   CFL Exchange Programme-Posters

Appendix 7:   Residential Energy Efficiency Education Programme Brochure