COMMERCIAL ELECTRICITY SUPPLY CHAIN MANAGEMENT PRACTICES IN KENYA

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DECLARATION

I, the undersigned, declare that this is my original work and has not been submitted to any other college, institution or university for academic credit.

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This project report has been submitted for examination with my approval as the appointed supervisor.

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DEDICATION

I dedicate this paper to my family, workmates and friends; you all stood by me throughout this programme and inspired me immensely.

ABSTRACT

Supply Chain Management (SCM) has emerged to be one of the areas of enhancing efficiency in an organization. According to Energy Regulatory Commission (ERC), the increasing operational complexities within the electric subsector, delays in electricity connection and disruption in power supply, higher manpower costs owing to higher living costs and growing pressure from customers have led to the electric power utilities' growing awareness of the impact that an efficient supply chain can have on business sustainability.

The purposes of this study was to establish the commercial electricity SCM practices in Kenya and whether the adopted practices exhibits SCM best practices relevant to these utilities . This study focused on the most significant SCM practices that affect the efficiency and effectiveness of the whole electricity supply chain.

This study adapted a descriptive research design. The study targeted at all power firms involved in generation, transmission and distribution of electricity for commercial purposes as these firms were considered to be the principal players in the commercial electricity supply chain. The researcher used questionnaires to gather primary data to describe some of the SCM practices in the commercial electricity power utilities. This is because a descriptive design is a description of state of affairs as it exists at present. Descriptive statistical analysis was done.

The study concluded that there are a number of SCM practices adopted by the commercial electricity utilities in Kenya and to a large extent the adopted practices are in line with the best practices as prescribed using Supply Chain Maturity model. Recommendations for improvements in each functional area were also made. It was further suggested that a similar research may be conducted in other sectors of industry such as manufacturing or agriculture.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABBREVIATION AND ACRONYMS

CRM	Customer Relationship Management
COM	Customer Order Management
CPFR	Collaborative Planning Forecasting and Replenishment
EDI	Electronic Data Interchange
ERB	Electricity Regulatory Board
ERC	Energy Regulatory Commission
GOK	Government of Kenya
IPP	Independent Power Producers
KENGEN	Kenya Electricity Generating Company
KETRACO	Kenya Electricity Transmission Company
KPLC	Kenya Power and Lighting Company
MOE	Ministry of Energy
PPA	Power Purchase Agreements
SCOR	Supply Chain Operation Reference
SCM	Supply Chain Management
SPSS	Statistical Package for Social Science
SRM	Supplier Relationship Management
TOC	Theory of Constraints
VMI	Vendor Management Inventory
3PL	Third Party Logistics
4PL	Fourth Party Logistics

CHAPTER ONE: INTRODUCTION

1.1 Background of the Study

Supply Chain Management (SCM) has emerged to be one of the areas of enhancing efficiency in an organization. High customer expectations, environmental changes, globalization and rapid technological changes, companies have to re-engineer their ways of doing business in order to remain competitive. This calls for development of best practices in all organisational functions in order to ensure that organisation is in line with the current business treads. Supply Chain function is not an exception (Christopher & Lee, 2004).

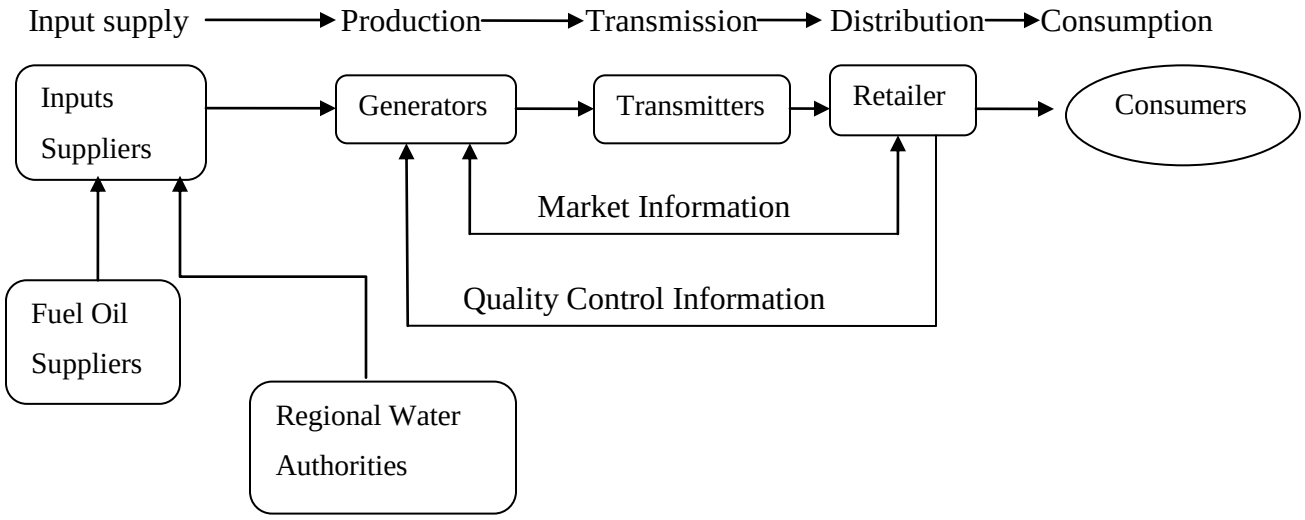
Globally, SCM has received a worldwide recognition as a key business process through which suppliers are able to provide products, services and information that add value to customers and other stakeholders (Chan & Qi, 2003). It should be therefore a proactive approach through which the buyer(s) decide to relate and collaborate with sellers willingly or non- willingly for mutual benefit because each party need the other for survival.

Thomas (2004) argues that supply chain executives have a daunting daily challenge of managing a global supply chains. They must keep customers or stores properly stocked and deliver the perfect order every time. They must also balance the need for low costs, proper inventory levels and maximum service delivery. In addition they must ensure that SCM is an integral component of the company's strategic direction and plans.

1.1.2 Kenya Electricity Supply Chain

In Kenya, electricity supply chain involves activities in power production, transmission, distribution and consumption. These activities include materials planning, forecasting, purchasing, inventory management, and information management, quality assurance, scheduling production/generation, warehousing of spare parts, distribution, delivery/transport, reverse logistics, disposal and customer service (Heizer & Render, 2008). Therefore today's commercial electricity supply chain can be illustrated using figure 1.1 below;

Figure 1.1: Commercial Electricity Supply Chain



Source: Researcher, 2011

Generation is the process which converts the various primary fuels used into electricity. Kenya Electricity Generating Company (KenGen) is the leading power generating company with an installed capacity of 1005MW hence producing 77% of electricity in Kenya. Six more electricity generators under the umbrella of Independent Power Producers (IPPs) have been licensed. These are; Iberafrica Power (EA) Ltd with an installed capacity of 108MW, Tsavo Power Company Ltd

generating 74MW, OrPower4 Inc. generating 48MW, Mumias Sugar Company Ltd generating 26MW and Rabai Power Ltd which has an installed capacity of 90MW (Anon, 2002). In addition these, the government formed Geothermal Development Company (GDC) as a Special Purpose Vehicle to fast track the development of geothermal power. Other generators include James Finlay, Sotik Tea Company, Sotik Highlands Tea Estate, Oserian Development Company, Pan African Paper Mills, Unilever Tea Kenya Ltd and Tiomin, who are licensed to generate electrical energy for own use (Wanyiri, 2010).

Previously, transmission function has been not been subject to competitive activity and had remains under the control of the Kenya Power and Lightning Company (KPLC). However, KPLC was split to create Kenya Electricity Transmission Company (KETRACO) such that KPLC performs distribution while KETRACO performs transmission (Energy Regulatory Commission [ERC], 2009).

The final link in the chain is distribution. This involves taking electricity from the transmission system and connecting it to consumers and business users at the point of consumption. Distribution of electricity is carried out by KPLC, though KETRACO and generators following resent reforms have been bought outright parts of the regional distribution network (ERC, 2009). KPLC buys electricity from the generating companies and provide a service to the end customers. The supply firm is who we deal with as consumers and with whom we have the trading relationship. It can be seen from this brief overview that there exist a value chain electricity hence the need to study the relevant SCM practices adopted by the players.

1.2 Statement of the Problem

The Theory of Constraints (TOC) which is based on the argument that chain is no stronger than its weakest link, calls for integration of processes, organizations and practices for continual achievement of a common goal. In Supply Chain Management, this theory is useful in addressing a single link in supply chain and more so across the entire system even when the system comprises of many different organizations. The objective of the theory is to establish a decisive competitive edge by reducing negative impacts of interruption by shortages or surpluses (Herman, 2000). In Kenya, demand of electricity, inadequate electric power generation, developing transportation/transmission/distribution technologies and growing customer expectations have forced players in electric power subsector to invest in, and direct attention to, their supply chains. Consequently, there is pressure on these utilities to be efficient and enhance customer service levels.

According to ERC (2009), increasing operational complexities within the electric subsector, delays in electricity connection and disruption in power supply, higher manpower costs owing to higher living costs and growing pressure from customers have led to the electric power utilities' growing awareness of the impact that an efficient supply chain can have on business sustainability and hence the need for prudent Supply Chain Management in the electricity industry.

Supply Chain Management Practices and their related challenges have been extensively documented. Christopher and Lee (2004) suggests that any drive towards more efficient supply chains during recent years has resulted in supply chains becoming more likely to be disrupted and prone to more challenges.

Supply Chain Management in the electric power sector in Kenya has received relatively little attention. Wanyiri (2010) studied Total Quality Managements Practices in thermal power plants and found that all the thermal power plant had TQM policies in place but concentrated more on environmental management. Njau (2010) discussed value chain management and its effects in oil companies in Kenya, noting the improvements which have been made, and still need to be made, in purchasing and supply professionalism. However, the focus of this latter work has been predominantly on value chain in energy sector as opposed to the broader concept of Supply Chain Management Practices and their relevance to the electricity supply chain.

A recent research done by Barua (2010) highlighted the various challenges facing oil marketing companies noting a dismal understanding of the Supply Chain Management practices in place even though the companies were practicing them through strategic planning, Third Party Logistics (3PL), SC benchmarking, vertical integration, close partnership with suppliers E-procurement and outsourcing. In his findings he noted that Production and Operations Management practices were not operational. His study too did not cover electricity power utilities.

This study investigated Supply Chain Management Practices as adopted by the commercial electricity utilities in Kenya. The study excluded those firms who are licensed to generate electricity for their own use such as James Finlay, Sotik Tea Company, Sotik Highlands Tea Estate, Oserian Development Company, Pan African Paper Mills, Unilever Tea Kenya Ltd and Tiomin. The study focused on the most relevant SCM practices which have a direct relationship with the efficiency and effectiveness of their operations and of the whole electricity supply.

1.3 Objectives of the Study

1) To establish Supply Chain Management practices adopted by the Commercial Electricity utilities in Kenya.
2) To establish whether the adopted practices exhibits SCM best practices relevant to these utilities.

1.4 Value of the Study

The findings of the research provide additional knowledge for future studies on the subject area of study.

It also provides background information which may help to design appropriate Supply Chain Management strategies that can be adopted for circumstances suitable to the current challenges prevailing in the industry. Those challenges related to power rationing, increasing demand and delayed in electricity connectivity.

CHAPTER TWO: LITERATURE REVIEW

2.1 Defining Supply Chain Management

Supply Chain Management is the systemic, strategic coordination of the traditional business functions and the tactics across these business functions within a particular company and across businesses within the supply chain, for the purposes of improving the long-term performance of the individual companies and the supply chain as a whole (Mentzer, De Witt, Keebler, Min, Nix, Smith & Zacharia, 2001).

SCM is defined by the Global Supply Chain Forum as the integration of business processes from end-user through original suppliers that provide products, services and information that add value for customers and other stakeholders (Cousins, Lamming, Lawson & Squire, 2008). SCM is the design and management of seamless, value-added processes across organizational boundaries to meet the real need of the end customer. The development and integration of people and technology resources are critical to successful supply chain integration (Institute of Supply Management [ICM], 2000).

A supply chain is a network of organizations that are involved, through upstream and downstream linkages, in the different processes and activities that produce value in the form of products and services in the hands of the final customer or consumer (Lysons & Farrington, 2006). A supply chain, as opposed to supply chain management, is a set of organizations directly linked by one or more of the upstream and downstream flows of products, services, finances, and information from a source to a customer. Managing a supply chain is 'supply chain management' (Mentzer et al., 2001).

2.2 Commercial Electricity Supply Chain Management Practices

Kenya Electricity Supply Industry (ESI) is one of the sub-sectors in the energy sector over which the Ministry of Energy (MoE) exercises oversight on behalf of the Government of Kenya (GoK). The privatization programme of the 1990s brought a degree of competition into this electric sub-sector supply chain for the first time when the former monopoly of the KPLC was unbundled into three entities with the enactment of the Electric Power Act No. 11 of 1997 (Anon, 2002). KPLC to carry out transmission and distribution functions, KenGen to carry out the generation functions and ERB to regulate the power sector. The Act aimed at facilitating private sector participation in the provisions of electricity services. The Act also allowed IPPs to enter into Power Purchase Agreements (PPAs) with KPLC in order to add more power into the grid. In 2007, the government converted Electricity Regulatory Board (ERB) to ERC in 2007 to offer regulatory stewardship to electricity, petroleum and new and renewable sub-sectors (Energy Bill, 2004).

Despite the emergence of a structure of private and public ownership in this subsector, the Government maintains a regulatory stance towards businesses in the old 'public' sector. For example, the rules for purchasing practice by public entities in the sub sector as a whole are covered under the Public procurement directives which detail the obligations public sector organizations must follow in relation to tendering of business and the awarding of contracts to suppliers (Anon, 2002). The private players may or may not follow the same procurement directives as public entities. This brought the issue of different players having different supply chain practices though working towards fulfillment of a common objective which is adequate electric power energy in the country.

The Supply Chain Operations Reference (SCOR) model gives a list of five generic supply chain processes from which practices are derived. These are plan, source, make, deliver and return. Altekar (2005); Power (2005), views that SCM processes can be categorized into the following types; Plan-Demand Management, Source- Procurement Management, Make-Operations/Manufacturing Management, Deliver- Logistics Management and Return- Reverse Logistics. In addition there are other supporting systems which run across the whole supply chain and contribute to the success of the system. These include; Information Technology (IT) for SCM, SCM Performance Measurements and Customer/Supplier Relationship Management. These processes form the basis of which various practices are derived.

2.2.1 Demand Management

Collaborative Planning Forecasting and Replenishment (CPFR) is one of best practices in demand management. CPFR entails real time information sharing and real time decision making based on the information received. The decision making is synchronized between all the players in the supply chain (Stevenson, 2005).

Demand management has shifted over the years. In the 1970's the focus was integration of warehousing and transportation within the firm, in the 1980's the focus shifted to re-engineering of cost structures, while in the 1990's the focus shifted to improving customer service with the introduction of corporate websites, internet, intranets and extranets. Today, there has been a paradigm shift to what is known as collaboration as managers realize that long term success of the firm will be achieved if they work within a successful supply chain. This new concept is known as Collaborative Planning Forecasting Replenishment (Stevenson, 2005; Walters, 2008).

In electricity generation the key is to ensure that the contracted plant capacity is maintained. This is by way of providing maintenance spare parts as scheduled for each type of engine required for generation. Another aspect is that of ensuring that Plant availability is above 80% at any given time. On the distribution the demand for electricity outstrips the supply.

The demand for power has been rising faster than anticipated. Peak demand in 2003 was 790MW but has grown to the current of 1,300MW. With an installed capacity of 1,412MW it is evident that there is little reserve margin for system maintenance (Wanyiri, 2010). The effect is that efficient the power utilities must have an efficient supply chain management system such that no plant can be stopped for service maintenance until all required spare parts are availed.

2.2.2 Procurement Management

The main role of procurement is to acquire the materials needed by an organization for its operations. Procurement or purchasing consists of all the related activities that get goods, services and materials from suppliers into the organization. The aim of procurement is to find the combination of products and suppliers that best satisfies your need (Waters, 2002). Procurement involves the process of product specification or specifying of requirements, then development of a procurement plan and raising of purchase requisition, identification of potential suppliers, sending quotation, receiving and assessment of bids, selecting the right source, negotiating and placing of order, expediting delivery and receipts, invoice verification and forwarding for payment (Mentzer et al., 2001).

For the power utility firms it is crucial to establish the right sources of raw material. This is especially so for the thermal power plants which uses Heavy Fuel Oil (HFO) with low sulphur

content of less than 1%. Open tendering system is used by both IPPs and KenGen. On the procurement of spares it is highly recommended to use the Original Equipment Manufacturers.

One of the best practices in procurement is the adoption of the e-procurement. According to Baily (2008) the savings on adoption of e-procurement is estimated 40% of overall procurement costs .E- Procurement process in the power utility firms enables the establishment and sourcing of OEM parts directly from the manufactures of the power engines and peripherals. It also enables support services by the firms being able to trouble should the engines online hence reducing the down time on engines during maintenance services.

2.2.3 Operations Management

The focal point of every organization is the activities that make its products or services. These are the operations. According to Waters (2002), everything that you own, use, buy or borrow is a product of some organization operations. This is the Converting inputs to the desired outputs through processes. For the case of power utilities, the inputs include raw materials, money, people machines time and other resources required in the generation and distribution of electricity power.

According to KIPPRA (2006), power utilities are linked by the national grid system which is operated as an integral network, linked by a 220 kV and 132 kV transmission network. A limited length of 66 kV transmission lines is also in use. At the generating plants the energy is produced at a relatively low voltage between about 2.3 kV and 30 kV, depending on the size of the unit. The generator terminal voltage is then stepped up by the power station transformer to a higher voltage from 132 kV to 220 kV for transmission over long distances.

At the substations, transformers reduce the voltage to a lower level for distribution to commercial and residential users. This distribution is accomplished with a combination of sub-transmission (33 kV to 132 kV) and distribution (3.3 to 25 kV). At the point of use, the energy is transformed to low voltage varying by country and customer requirements (Energy Bill, 2004).

2.2.4 Logistics Management

Logistics is the process of planning, implementing, and controlling the efficient and effective flow of storage of goods, services and related information from the point of origin to the point of consumption for the purpose of conforming to customer requirement (Altekar, 2005). This encompasses the eight elements of Customer Order Processing, Location Analysis, Inventory Control, Material Handling, Packaging, Transportation, Warehouse and Customer Services.

Customers Order Management (COM) starts with order entry process and involves efficient maintenance of customer data bases, opportunity evaluation for cross selling and up selling, back order processing and post order fulfillment transactions. This means that there need to be a satisfactory customer order management (Webster, 2008).

Sanderson (1999) argues that there is need for collaborative transport management in order to optimize service delivery and minimize cost. Therefore there is need for vertical collaborations with suppliers, customers and horizontal collaboration with other organizations. Transport collaboration is not just about minimization of cost, it is about value optimization, visibility, improved service levels, end customer satisfaction as well as potentially lower cost (Hammer, 2001)

Electricity utilities have outsourced most of their logistics functions to a 3PL such as clearing and forwarding agents. 3PL refers to the concept of outsourcing the logistics and distribution of a manufacturing and services firms to a logistics service provider. On the other had Fourth Party Logistics (4PL) is an arrangement in which a firm hires a specialist firm to manage logistical operations of two or more 3PL firms already outsourced. Companies may outsource logistics services in order to improve their strategic focus by concentrating on their key competences, lower cost of operations, minimize risk in the operations, improvement of service levels with improved response time and increased flexibility (Altekar, 2005).

2.2.5 Customer/Supplier Relationship Management

Customer Relationship Management (CRM) is a complex and interrelated concept with Supplier Relationship Management (SRM) this is because Suppliers can become Customers and vice versa. The process provides the structure for how the relationships with the customers and suppliers are developed and maintained. This process includes identifying key customers/suppliers, segmenting them and in order to maximise their contribution services in service delivery. The process also includes all activities related to working with customers in order to: improve processes, eliminate demand variability and non-value added activities and develop agreements of metrics (Jacobs, Chase & Aquilano, 2009).

Customer service policy statements starts with identifying elements of service which are most important to customers such as availability and capacity of electricity supply (Aquilano et al., 2009). Elements of customer service can be categorized into pre-transaction, transaction and post-transaction elements. The customer service policy as a pre-transactional customer service element should be stated in writing and made available to customers.

Some of the best practices in CRM like customer focus groups and customer satisfaction surveys are increasingly being employed by firms. On the other had SRM takes the form of electronically exchanging of data through the national grid control system and EDI used during ordering for the spare parts and monitoring of consignment on transits (Waters, 2002).

2.2.6 Supply Chain Performance Measurements

Companies from time to time have to decide a certain performance criteria and also have to come up with a way of measuring that the criteria is met. Use performance measurement to gain insight into, and make judgments about, the effectiveness and efficiency of their programs, processes, and people. The organizations therefore must decide on what indicators they will use to measure their progress in meeting strategic goals and objectives, gather and analyze performance data, and then use these data to drive improvements (Mentzer et al., 2001).

One of the frameworks used for performance measurement is Kaplan and Norton's Balanced Scorecard. It is a management system that maps an organization's strategic objectives into performance metrics in four perspectives: financial, internal processes, customers, and learning and growth (Kaplan & Norton, 1996). Within each of the Balanced Scorecard financial, customer, internal process, and learning perspectives, the firm must define the following: Strategic objectives, what strategy is to be achieved in that perspective, Measures how progress for that particular objective will be established and the target value sought for each measure.

2.2.7 Information Technology (IT) for Supply Chain Management

With globalization IT has became the main tool by which businesses have to create a competitive advantage over their rivals. This is by means of multiple sourcing, Computer Aided Design

(CAD)/Computer Aided Manufacturing (CAM), Computer integrated Manufacturing (CIM), Manufacturing Execution Systems, Management Information Systems (MIS), Decision Support Systems, Expert Systems, Knowledge Management Systems, Enterprise Resource Planning (ERP), Customer Relationship Management (CRM) and Supply Chain Management (SCM) systems. SCM encompasses ERP, manufacturing, warehouse management systems, transportation management systems, business intelligence and analysis.

The main objectives of IT in SCM include: providing information availability and visibility, enabling a single point of contact for data, allowing decisions based on total supply chain information and enabling collaboration with supply chain partners (Simchi-Levi & Kaminsky, 2003). The internet has played a key role in advancing SCM capabilities since a firm can connect its supply chain with the supply chains of suppliers and customers in a single vast network that optimizes costs and opportunities. The aspect of Scada communication of remotely diagnosing engine failures shows how useful the IT system is to operations and maintenance.

The major use of IT in supply chain include : an enterprise resource planning (ERP) system, e-commerce software, c-commerce gateway, an automatic identification system such as bar coding and a business intelligence reporting system. Some of the supported functions were: centralized electronic catalogue, electronic requisitioning, electronic purchase order, electronic order acknowledgement, advanced ship notice, electronic invoice and electronic funds transfer.

2.3 Supply Chain Management Best Practices

A practice may refer to a conventional, traditional, or otherwise standardised method of doing thing. Best practices are generally-accepted, informally-standardized techniques, methods or

processes that have proven themselves over time to accomplish given tasks. The idea is that with proper processes, checks and testing, a desired outcome can be delivered more effectively with fewer problems and unforeseen complications (Nash & Ehrenfeld, 1997). In addition, a good practice can evolve to become better as improvements are discovered. They are used to maintain quality as an alternative to mandatory legislated standards and can be based on self-assessment or benchmarking. These practices should help improve performance metrics by creating consensus on demand management, forecasting, benchmarking, performance measurement, information technology procurement, customer relationship management among others.

Lockamy & McCormack (2004) developed the Supply Chain Maturity Model, borrowing heavily from the Business Process Orientation Model and the SCOR. This model postulates that the operations of an organization transition have five distinct stages before attaining maturity and excellence. They went ahead and said that only organizations that have reached the maturity stage exhibit best practices. The five stages of maturity show the progression of activities toward effective SCM and process maturity. Each stage contains characteristics associated with process maturity such as predictability, capability, control, effectiveness and efficiency. This can be illustrated using the table on the page below:

Figure 2.1: Stages of the Supply Chain Maturity Model

STAGE	CHARACTERISTICS OF STAGE
1. Ad hoc/Static supply chain	– Processes are unstructured and ill-defined – Little supply chain information available, Process measures are not in place – Minimal communication with partners – Jobs and organizational structures are not based on horizontal SCM processes. – Individual heroics and "working around the system" arc what makes things happen. – Process performance is unpredictable. – Targets, if defined, are often missed. – SCM costs are high. – Customer satisfaction is low. – Functional co-operation is also low.
2. Defined/Functional Excellence	– Basic SCM processes are defined and documented. – Jobs and organization basically remain traditional. – Process performance is more predictable. – Tat gets are defined but still missed more often than not. – Overcoming the functional silos takes considerable effort owing to boundary concerns and competing goals. – SCM costs remain high. – Customer satisfaction has improved, but is still low.
3. Linked-Horizontal integration	– Represents the breakthrough level. – Managers employ SCM with strategic intent and results. – Broad SCM jobs and structures are put in place outside and on top of traditional functions. – Cooperation between intra-company functions, vendors and customers takes the form of teams that share common SCM measures and goals that reach horizontally across the supply chain. – Process performance becomes more predictable and targets are often achieved. – Continuous improvement efforts take shape focused on root cause elimination and performance improvements. – SCM costs begin decreasing and feelings of esprit

	de corps take the place of frustration. – Customers are included in process improvement efforts and customer satisfaction begins to show marked improvement.
4. Integration/ External collaboration	– The company, its vendors and suppliers, take cooperation to the process level. – Organizational structures and jobs are based on SCM procedures, and traditional functions, as they relate to the supply chain, begin to disappear altogether. – SCM measures and management systems are deeply imbedded in the organization. – Advanced SCM practices, such as collaborative forecasting and planning with customers and suppliers, take shape. – Process performance becomes very predictable and targets are reliably achieved. – Process improvement goals at e set by the teams and achieved with confidence. SCM costs ate dramatically reduced – Customer satisfaction and esprit de corps become a competitive advantage.
5. Extended/On demand supply chain	– Competition is based on multiform supply chains. – Collaboration between legal entities is routine to the point where advanced SCM practices that allow transfer of responsibility without legal ownership are in place. – Multi-firm SCM teams with common processes, goals and broad authority take shape. – Trust, mutual dependency and esprit de corps are the glue holding the extended supply chain together. – A horizontal, customer focused, collaborative culture is firmly in place. Process performance and reliability of the extended system are measured and joint investments in implying the system are shared, as are the returns.

Source: Researcher, 2011

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Research Design

A descriptive study was undertaken to ascertain and describe some of the SCM practices in the commercial electricity utilities. This is because a descriptive design is a description of state of affairs as it exists at present. The study was modelled alongside the Supply Chain Maturity Model as espoused by Lockamy and McCormack (2004). The results are benchmarked against best practices that define the extended stage of the supply chain maturity. These include: end-to-visibility, collaboration in all areas, customer driven demand and global outsourcing.

3.2 Population of the Study

The study targeted at all commercial power firms involved in generation, transmission, and distribution of electricity as these firms are considered to be the principal players Supply Chain of the electric power. The approach was a census survey since the firms involved are few. These firms are provided in the table 3.1 below;

Figure 3.1: Target Population of the Study

Function of Target Firm in the Supply Chain	**Name of the Firms**	**No. of Firms**
Generation	KENGEN, Iberafrica, Tsavo, Orpower4, Mumias, Rabai and GDC	7
Transmission/Distribution	KETRACO and Kenya Power	2

Source: Researcher, 2011

3.3 Data Collection Method and Instruments

Primary data was used to establish the various SCM practices adopted by the utility players in which case primary data is the most appropriate. Target respondent were Senior Managers in charge of Supply Chain. The subjects discussed included supply chain structures and policies, procurement strategy, e-Business adoption issues, the role of external players and their conformity to supply chain management best practices.

A questionnaire was used with the aim of assessing the various positions of different firms under the study in terms of application of best SCM practices. The following processes were assessed: Demand management, procurement management, logistics management, customer/supplier management, IT for SCM and performance measurements. The respondents were required to indicate one answer on a 5-point Likert scale at the end of each question.

The questionnaire was self administered. One questionnaire was sent to each company and circulated to all relevant departmental heads in order to get feedback for supply chains within the electricity supply chain. The questionnaires were distributed to the respondents, who filled them. The questionnaires were collected from the respondents once they are filled.

3.4 Data Analysis

The questions were grouped as per the SCM functional area highlighted earlier as: Demand management, Operations Management Procurement management, Logistics management, Customer/Supplier Management, IT for SCM and Performance measurements. Descriptive and inferential statistics was used to summarize the information.

CHAPTER FOUR: DATA ANALYSIS, RESULTS AND DISCUSSION

4.1 Descriptive Statistics of Power Utilities Studied

Before embarking on the details of empirical issues, it's important to examine demographics characteristics of the power utilities studied. All the nine utilities in power sector targeted responded and we can say the study achieved 100% response rate. All the respondents from power utilities studied are procurement officials except respondent from Mumias Sugar Company who was an engineer. This implies the respondents are familiar with SCM practices in their utilities and hence are capable of commenting and providing answers to questions under investigation.

As table 4.1 shows, 44.44 % of the respondents have worked for the power utilities for 5 to 10 years, 33.34% have worked for less than five years while 22.22% have worked for over ten years. This indicates that the most secretaries have worked for long within the electrical power industry hence they are aware of their utilities activities as well as on issues under investigation.

Table 4.1: Years of Experience of Respondents in Power Industry

Years of Experience of Respondents	**Frequency**	**Percentage**
Less than 5 Years	3	33.34
5 - 10 Years	4	44.44
Over 10 Years	2	22.22
Total	**9**	**100**

Source: Researcher, 2011

4.2 Supply Chain Management Practices Adopted by Power Utilities in Kenya

Descriptive statistics are used to describe and summaries the responses of the respondents on SCM practices adopted by the commercial electricity utilities in Kenya. The descriptive statistics utilized in this part is mean. The mean is a measure of central tendency, and provides an arithmetic average for the distribution of scores. For each practice respondents were asked to rate their opinion implementation status on various aspects of practices using a five likert scale: definitely implemented = 5, often implemented = 4, frequently implemented = 3, sometimes implemented = 2 and not implemented = 1. For each opinion, mean score was calculated. To establish Supply Chain Management practices adopted by the Commercial Electricity utilities in Kenya, a mean of means for each practices implemented was calculated and reported on table 4.2 below. All the mean scores were above the expected average of 2.5 implying that all the practises are implemented by power utilities.

Table 4.2: Implementation Status of Supply Chain Management Practices

Supply Chain Management Practices	Mean Score	Status of Implementation
Procurement Management	3.795	Often Implemented
Customer/Suppliers Relationship Management	3.776	Often Implemented
Operations Management	3.608	Often Implemented
Demand Management	3.573	Often Implemented
Logistics Management	3.214	Frequently Implemented
Information Technology for Supply Chain Management	3.032	Frequently Implemented
Supply Chain performance Measurements	2.868	Frequently Implemented

Source: Researcher, 2011

Procurement Management is the most implemented practice with a mean score of 3.795 followed by Customer/Suppliers Relationship Management with a mean of 3.776. Other followed in this order Operations Management, Demand Management, Logistics Management, Information

Technology for Supply Chain Management and then Supply Chain performance Measurements with mean scores of 3.608, 3.573, 3.214, 3.032 and 2.868 respectively. It therefore appears that all SCM practices considered in the literature review are implemented by the power utilities in Kenya however, the rate/frequency of implementation differ for each practices; while as demand management, procurement management, operations management and customer/suppliers relationship management are often implemented, the logistics management, supply chain performance measurements and information technology for supply chain management are frequently implemented.

4.3 Supply Chain Management Best Practices in Power Utilities in Kenya

In order to understand whether the SCM practices implemented exhibits best practices, each respondent was asked rate the implementation of best practices conforming to the practices. Respondents' responses were rated in a 5 likert scale. The mean score for each best practice were calculated and presented using tables. Mean score of 5, 4 and 3 implies that the best practices are applied, below this was considered that best practices are not implemented. Below is the report of best practices applied by power utilities in each functional area considered.

4.3.1 Demand Management

The demand for power has been rising faster than anticipated. There demand planning is very important to ensure adequate power supply. In demand planning it is important to consider the best practices. Table 4.3 below shows some of the best practices and how they were scored by the respondents. There is less formal involvement of suppliers in the process of forecasting and quantification. At the same time need assessment and customer requirement is captured for the purposes of planning .This confirms with finding of Stevenson (2005) that Collaborative Planning

Forecasting and Replenishment (CPFR) is one of best practices in demand management. The results are presented using table 4.3 below:-

Table 4.3: Supply Chain Management Best Practices in Demand Management

Best Practices	**Mean Score**	**Status of Implementation**	**Does best practices apply**
Need assessment is done before acquisition	4.33	Often implemented	yes
All items are known and we have established a coding system	4.33	Often implemented	yes
There is a system of capturing customer requirement at any given time.	3.78	Often implemented	yes
We have implemented a stocks management system for spare parts for un-programmed Maintenance activities	3.78	Often implemented	yes
There is a demand planning based on statistical modelling techniques e.g. Collaborative Planning Forecasting and Replenishment (CPFR),ABC analysis , ERP e.t.c	3.44	Frequently implemented	Yes
There is a formal involvement of suppliers in the process of forecasting and Quantification.	1.78	Sometimes implemented	No
Mean of Means Score	**3.573**	**implemented**	**Yes**

Source: Researcher, 2011

4.3.2 Procurement Management

Procurement is process of acquiring materials needed by an organization for its operations. Several activities are involved in procurement which are: product specification or specifying of requirements, then development of a procurement plan and raising of purchase requisition, identification of potential suppliers, sending quotation, receiving and assessment of bids, selecting the right source, negotiating and placing of order, expediting delivery and receipts, invoice verification and forwarding for payment. In Kenya power utilities the following best practices in procurement management are applied: reliability and flexibility are considered in supplier selection, all purchase orders and contracts are serially and easy to monitor with supporting

documentation and reconciliations for delivered items are always done in supplier presence. These findings confirms to arguments of Mentzer et al. (2001). The results are presented using table 4.4 below:-

Table 4.4: Supply Chain Management Best Practices in Procurement Management

Best Practices	**Mean Score**	**Status of Implementation**	**Does best practices apply**
All purchase orders & contracts are serially and easy to monitor with supporting documentation	4.56	Definitely implemented	Yes
We consider Reliability and Flexibility to be important in supplier selection.	4.56	Definitely implemented	Yes
The purchases always reflect the purchase plan guided by budget	4.33	Often implemented	Yes
We consider the 5Ps to be our key guide in supplier selection	4.13	Often implemented	Yes
We give equal opportunity to all prospective bidders by open tendering system and bids evaluation	3.89	Often implemented	Yes
Procurement process complains are documented	3.78	Often implemented	Yes
Reconciliations for delivered items are always done in supplier presence.	2.89	Frequently implemented	No
We have Implemented an EDI and world wide web for sourcing globally	2.22	Sometimes implemented	No
Mean of Means Score	**3.795**	**implemented**	**Yes**

Source: Researcher, 2011

4.3.3 Operations Management

The findings show the operations management in SCM in power utilities in Kenya exhibits the following best practices; internal and external customer complaints are timely responded to, there is continuous improvement strategy to encounter electricity trips, adequate utilization of factors, the firms meet obligations as per the PPA, there is maintain the stated availability, there is a maintenance schedules which are strictly followed and quality management system are audited regularly. This confirms views of Waters (2002) that the focal point of every

organization is the activities that make its products or services hence need to have best practices on these activities. The results are presented using table 4.5 below:-

Table 4.5: Supply Chain Management Best Practices in Operations Management

Best Practices	Mean Score	Status of Implementation	Does best practices apply
We have a quality management system audited regularly	4.57	Definitely implemented	Yes
Well trained staff are employed to run the operations of the plant	4.22	Often implemented	Yes
We have quality Management system that ensures the electricity availability is in place.	4.22	Often implemented	Yes
We have a Environmental Management System audited regularly	3.89	Often implemented	Yes
Our operations efficiency are easily measurable as per PPA	3.88	Often implemented	Yes
We have a continuous improvement strategy to encounter electricity trips.	3.44	Frequently implemented	Yes
We always respond to our internal and external customer complains in time.	3.33	Frequently implemented	Yes
We have a maintenance schedules in place which are strictly followed	3.33	Frequently implemented	Yes
We always meet our obligations as per the PPA.	3.25	Frequently implemented	Yes
We always maintain the stated availability	2.89	Frequently implemented	No
We always fulfil our utilization factor.	2.67	Frequently implemented	No
Mean of Means Score	**3.608**	**implemented**	**Yes**

Source: Researcher, 2011

4.3.4 Logistics Management

Logistics encompasses the eight elements of Customer Order Processing, Location Analysis, Inventory Control, Material Handling, Packaging, Transportation, Warehouse and Customer Services. It is important that all this activities follow the best practices. Logistics Management in power utilities exhibits the following; there is system of monitoring Materials and Spares in

Transits e.g. Logistics Management System, there is lead-time schedule available for all programmed spares, there use of returnable /reusable containers in logistics and there is collaborative transport management with a complete database of all our suppliers and agents. Best practices in logistics are frequently implemented with a mean average of 3.2 as described below:-

Table 4.6: Supply Chain Management Best Practices in Logistics Management

Best Practices	**Mean Score**	**Status of Implementation**	**Does best practices apply**
All overseas orders have specific code used for easier identification and Location monitoring	4	Often implemented	Yes
Logisticians are constantly updated with the changing laws and their implications	3.63	Often implemented	Yes
We have a system of monitoring Materials and Spares in Transits e.g. Logistics Management System	3.44	Frequently implemented	Yes
We have make use of returnable /reusable containers for our logistics	3.44	Frequently implemented	Yes
We have a lead-time schedule available for all programmed spares	3.22	Frequently implemented	Yes
We have collaborative transport management with a complete database of all our suppliers and agents	2.89	Frequently implemented	No
We have tools to measure performance of our 3PL providers	1.88	Sometimes implemented	No
Mean of Means Score	**3.214**	**implemented**	**Yes**

Source: Researcher, 2011

4.3.5 Supply Chain Performance Measurements

Power utilities use performance measurement to gain insight into, and make judgments about, the effectiveness and efficiency of their programs, processes, and people. The organizations therefore must decide on what indicators they will use to measure their progress in meeting strategic goals and objectives, gather and analyze performance data, and then use these data to drive improvements. However, it is important to consider best practice in performance

measurement. Supply chain performance measurements in power utilities exhibits the following Order cycle where all orders are monitored and suppliers are rated all the time, SCM Key Performance Indicators on which are reported every month, bench marking of various functions of supply chain and Balance Score Card is used.

Table 4.7: Supply Chain Management Best Practices in Performance Measurements

Best Practices	Mean Score	Status of Implementation	Does best practices apply
Supplier Evaluation and re-evaluation is done on a continuous basis	3.78	Often implemented	Yes
There is bench marking of various functions of supply chain	3	Frequently implemented	Yes
We have implemented Order cycle where all orders are monitored and suppliers are rated all the time	3	Frequently implemented	Yes
We have implemented SCM Key Performance Indicators on which are reported every month	2.88	Frequently implemented	No
Balance Score Card is used in our organization	2.67	Frequently implemented	No
SCOR model is implemented in our company	1.88	Sometimes implemented	No
Mean of Means Score	**2.868**	**implemented**	**No**

Source: Researcher, 2011

4.3.6 Customer/Suppliers Relationship Management

In electrical power, Customer Relationship Management (CRM) is a complex and interrelated concept with Supplier Relationship Management (SRM) this is because Suppliers can become Customers and vice versa. It is important Customer/Suppliers Relationship Management apply best practices. Some of the best practices in CRM in power utilities are: There is ERP system that has a customer relationship module for real time information on customers, customer is deemed important to power business, there is dedicated call centre for customer service, they visit their suppliers to ascertain Progress and real situations, and customers are reminded of overdue bill for settlement. These finding confirms with Aquilano et al., (2009) argument that

customer service policy statements starts with identifying elements of service which are most important to customers such as availability and capacity of electricity supply. The results are presented using table 4.8 below:-

Table 4.8: Supply Chain Management Best Practices in Customer /Supplier Relationship Management

Best Practices	**Mean Score**	**Status of Implementation**	**Does best practices apply**
We believe that customer is very important to our business	4.89	Definitely implemented	Yes
Suppliers have a freedom to visit us and discuss with us improvements	4.22	Often implemented	Yes
We frequently make contacts to our customers in order to respond to complains.	4.22	Often implemented	Yes
We have an elaborate system of gathering customer suggestions.	4.11	Often implemented	Yes
We vary our products and services are as per customer requirements.	4	Often implemented	Yes
My organization has a system for evaluating customer satisfaction.	3.89	Often implemented	Yes
My organization greatly considers customer requirements in the delivery of services/products.	3.89	Often implemented	Yes
We always consider our customers when making power generation decisions.	3.63	Often implemented	Yes
We always remind our customers of overdue bill for settlement	3.33	Frequently implemented	Yes
We have a dedicated call centre for customer service	3.25	Frequently implemented	Yes
We have an ERP system that has a customer relationship module for real time information to our customers	3	Frequently implemented	Yes
We are visit our suppliers to ascertain Progress and real situations	2.89	Frequently implemented	No
Mean of Means Score	**3.776**	**implemented**	**Yes**

Source: Researcher, 2011

4.3.7 Information Technology for Supply Chain Management

IT in SCM include: providing information availability and visibility, enabling a single point of contact for data, allowing decisions based on total supply chain information and enabling collaboration with supply chain partners. In power utilities the following Best Practices in Information Technology for Supply Chain Management are presences; there is an ERP system that has a customer relationship module for real time information to our customers, they have embraced e-sourcing and EDI in our supply chain management system, there have automated all our materials and spare parts for in our warehouse by use of bar coding system, there have an VMI to manage stocks which triggers our re-order points, and all supply chain information is stored in a centralized server and accessible by all supply chain stake holders.

Table 4.9: Supply Chain Management Best Practices in Information Technology for Supply Chain Management

Best Practices	**Mean Score**	**Status of Implementation**	**Does best practices apply**
All supply chain information is stored in a centralized server and accessible by all supply chain stake holders.	3.33	Frequently implemented	Yes
We have automated all our materials and spare parts for in our warehouse by use of bar coding system.	3.22	Frequently implemented	Yes
We have an ERP system that has a customer relationship module for real time information to our customers.	3.11	Frequently implemented	Yes
We have an VMI to manage our stocks which triggers our re-order points	3	Frequently implemented	Yes
We have embraced e-sourcing and EDI in our supply chain management system.	2.5	Frequently implemented	No
Mean of Means Score	**3.032**	**implemented**	**Yes**

Source: Researcher, 2011

CHAPTER FIVE: SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Summary of Findings

The purpose of this study was to establish Supply Chain Management practices adopted by the Commercial Electricity utilities in Kenya, and establish whether the adopted practices exhibits SCM best practices relevant to these utilities. The result reveals that a number of SCM practices are practiced by electrical power utilities in Kenya. These are; Procurement Management is the most implemented practice with a mean score of 3.795 followed by Customer/Suppliers Relationship Management with a mean of 3.776. Other followed in this order Operations Management, Demand Management, Logistics Management, Information Technology for Supply Chain Management and then Supply Chain performance Measurements with mean scores of 3.608, 3.573, 3.214, 3.032 and 2.868 respectively. It therefore appears that all SCM practices considered are implemented in similar manner by the power utilities in Kenya however, the rate/frequency of implementation differ for each practices; while as Demand Management, Procurement Management, Operations management and Customer/suppliers Relationship Management are often implemented, the Logistics Management, Information Technology for Supply Chain Management and Supply Chain Performance Measurements being the least implemented practice. In addition, to a larger extent there is application of best practices in most of these functions with the exception of Performance Measurements activities scoring a mean score of less that 3 which signified that best practices are not implemented in that area.

5.2 Conclusions

From the findings above, the one would conclude that the supply chain management practises adopted by commercial electricity utilities in Kenya are similar. Further it can be said that the processes of activities of demand management, procurement management, operations management, logistics management and reverse logistics in all commercial power utilities in Kenya to a large extent exhibits the best practises in supply chain management. In addition there are other supporting systems which run across the whole supply chain and contribute to the success of the system, these include; information technology (IT) for SCM, SCM performance measurements and customer /supplier relationship management.

5.3 Recommendations for Improvements

SCM best practices are generally-accepted, informally-standardized techniques, methods or processes that have proven themselves over time to accomplish given tasks. The findings of the study revealed that some SCM practices exhibits best practices while others do not. The following are recommended to improve supply chain performances in electric power generation, transmission and distribution.

In demand management there is need to formally involve suppliers in the process of forecasting and quantification. There is need to ensure assessment material is done before acquisition. There is need to ensure all materials are known and there established a coding system for all materials. There is need implemented a stocks management system for spare parts for un-programmed Maintenance activities.

In procurement management, there is need to embrace the EDI to guide in supplier selection, giving equal opportunity to all prospective bidders by open tendering system and bids evaluation is recommended, and the utilities should ensure that procurement process complains are documented and addressed.

In operations management, there is need for quality Management system that ensures the electricity availability is in place, utilities should ensure well trained staff are employed to run the operations of the plant, the management should ensure operations efficiency are easily measurable as per PPA and finally there is need to establish a Environmental Management System audited regularly.

With regard to supply chain performance measurements, there is need to ensure that SCM key performance indicators are set and necessary tools of Supply Chain Measurement such are Balance Score Card or SCOR are in place. Benchmarking purchase order cycles also require some improvement. This notwithstanding the need to have supplier evaluation and re-evaluation is done on a continuous basis in order to maintain relevant supplier databases.

To improve in customer/suppliers relationship management, there is need to have an elaborate system of gathering customer suggestions, suppliers need to have a freedom to visit us and discuss with us improvements need to streamline supply chain. The utilities should greatly consider customer requirements in the delivery of services/products.

In logistics management, the management should ensure logisticians are constantly updated with the changing laws and their implications, there in place tools to measure performance of 3PL

providers and all overseas orders have specific code used for easier identification and Location monitoring.

In general, Information Technology needs to be embraced in the entire the supply chain in order to ensure that relevant technology is applied. E-sourcing was rated very low when it should be fully implemented in this era of globalisation. Some models such as VMI and EDI could enhance efficiency in replenishment and warehouse management. More so IT for the in performance measurement in establishing lead time and consignment tracking in logistics management.

5.4 Recommendations for Further Research

The study was limited to the electricity industry utilities. A similar study may be done to other industry such as utilities such as manufacturing and agricultural sector.

REFERENCES

Altekar, R.V. (2005), *Supply Chain Management*. *Concepts and Cases*. New Delphi. Prentice-Hall of India.

Anon. (2002), *Public Procurement Directives* (available from: http://simap.eu.int/EN/pub/src/directiv.htm) Accessed: 05 June 2011

Baily, P. J. H. (2008). *Procurement principles and management*. Harlow, Englandl

Barua, J. (2010). *Challenges facing supply chain management in the oil marketing companies in Kenya* MBA project, University of Nairobi (unpublished)

Beth, S., Burt, D.N., Copacino, W., Gopal, C., Lee, H.L., Lynch, R.P. and Morris, S. (2006). 'Supply chain challenges: Building relationships', *Harvard Business Review on Supply Chain Management*. Boston: Harvard Business School Press.

Chan,F. and Qi H.J. 2003. *An innovative performance measurement method for supply chain management*: An international journal ,8,3:209-23

Christopher, M.and Lee, H. (2004), Building the resilient Supply Chain: An international journal of Logistics Management : 15,2:1-13.

Cousins, P., Lamming, R., Lawson, B. and Squire, B. (2008). *Strategic Supply Management, Principles, Theories and Practice*. Essex, England: Pearson Prentice-Hall

ERC (2009) *A New Energy Policy for Kenya?* Policy Briefing No.1, Energy Alternatives Africa Ltd. [Online] Available at: http://www. erc.go.ke/erc/energy_sub_sectors/ Accessed: 12 June 2011.

Gabru, F. (2008). 'Audit tool identifies supply chain gaps and improvement strategies', *Engineering News*, 25 July. [Online] Available at: http://www.aids.co.za/index. Accessed: 12 June 2011.

Hammer, M. (2001), 'The Superefficient Company', *Harvard Business Review*, September, pp.82-91

Heizer, J. and Render, B. (2008). *Principles of Operations Management* (7th edition). New Jersey: Prentice Hall.

Institute of Supply Management. (2000). Glossary of key supply management terms. [Online] Available at: http://www.ism.ws. Accessed: 13 June 2011.

Jacobs, F.R., Chase, R.B. and Aquilano, N.J. (2009). *Operations and Supply Management.* New York: McGraw Hill.

Kaplan, R. S. & Norton, D.P.(1996). The Balanced Scorecard: Translating Strategy into Action. Boston, Harvard Business School Press.

KIPPRA (2006), "*Demand for petroleum products in EA region*", KPC, Nairobi.

Lockamy, A. III; McCormack, K. (2004a). *The development of a supply chain management process maturity model using the concepts of business process orientation*. International Journal Supply Chain Management, 9(4), 272-278

Lysons, K. and Farrington, B. (2006). *Purchasing and Supply Chain Management* (7th edition). Essex, England: Pearson Education

Ministry of Energy (2004). The Energy Bill, 2004. Nairobi: Ministry of Energy.

Monczka, R., Handfield, R., Giunipero, L., Patterson, J.L. and Waters, D. (2010) *Purchasing and Supply Chain Management* (4th edition). Hampshire, UK: Cengage Learning.

Mentzer,J.T., De Witt,W., Keebler,J.S,, Min,S. Nix,N.W., Smith,C.D and Zacharia,Z.G., (2001): *Defining Supply Chain Management*, in: Journal of Business Logistics, Vol. 22, No. 2, 2001, pp. 1–25

Nash, J. and Ehrenfeld, J., (1997). *Codes of environmental management practice*: *assessing their potential as a tool for change.* Annual Review of Energy and the Environment 22, 487-535

Njau, N. (2010). *Investigation on the Impact of Value Chain Management Strategy on Performance. A Study of major oil Companies in Kenya.* MBA project, University of Nairobi (unpublished)

Power, D. (2005) 'Supply chain management integration and implementation: A literature review', *Supply Chain Management: An International Journal*, 10(4): 252–263

Sanderson, J. (1999), 'Passing value to customers: on the power of regulation in the industrial electricity supply chain', *Supply Chain Management: An International Journal*, Vol. 4, No. 5 pp. 199-208

Simchi-Levi, D., Kaminsky, P. and Simchi-Levi, E. (2009) *Designing and Managing the Supply Chain: Concepts, Strategies and Case Studies* (3rd edition). New York: McGraw-Hill.

Herman, S. (2000). '*An investigation into Fundamentals of Critical Chain Project Scheduling, International Journal of Project Management*, (19): 363–369.

Stevenson, W. (2005). *Operations Management* (8th edition, International edition). Boston, MA: McGraw-Hill.

Thomas (2004). *More Challenges for Supply Chain Management,* Lloyd's FTB, Asia

Wanyiri N. (2010). *An assessment of the Total Quality Management Practices in the Thermal Power Plants in Kenya.* MBA project, University of Nairobi (unpublished)

Waters, D. (2002). *Operations Management:Producing goods and services* (2nd edition). Prentice Hall, Harlow, England

Webster, S. (2008). *Principles and Tools for Supply Chain Management*. New York: McGraw Hill.

APPENDICES

Annex I: Research Instruments

PART A: Introduction Letter

Dear Respondent,

I am a MBA student at University of Nairobi currently undertaking my research project entitled "Commercial Electricity Supply Chain Management Practices in Kenya". The attached questionnaire is for gathering data, which will be useful in the aforementioned research. You have been selected as one of the respondents in this study. I therefore request you to kindly facilitate the collection of the required data by answering the questions herein.

Please note the information sought is purely for academic purposes and will be treated with utmost confidentiality.

I look forward to your co-operation.

Yours faithfully,

Joseph Murage

PART B: Questionnaire

The purpose of this questionnaire is to investigation of Supply Chain Management Practices being used in the electricity generation, transmission and distribution in Kenya. Kindly answer by ticking on the boxes provided or by writing a brief statement in the provided spaces.

SECTION A: General Information

1. Name of the organization _____

2. Nature of core business
    a. ☐ Electricity Generation
    b. ☐ Electricity Transmission
    c. ☐ Electricity Distribution
    d. Other (Specify) _____

3. Position in the organization _____

4. Your department_____

5. Experience at the organization (in years) _____

SECTION B: Supply Chain Management Practices

Using a likert scale of 1-5, indicates the extent to which your company implements the practices listed below. Kindly score by ticking each practice as objectively as possible using the following guide lines:

1. Not Implemented
2. Sometimes Implements
3. Frequently Implemented
4. Often Implemented
5. Definitely Implemented

No.	**Demand Management**	1	2	3	4	5
1	There is a system of capturing customer requirement at any given time.					
2	There is a demand planning based on statistical modelling techniques e.g. Collaborative Planning Forecasting and Replenishment (CPFR),ABC analysis , ERP e.t.c					
4	Need assessment is done before acquisition					
5	All items are known and we have established a coding system					
6	We have implemented a stocks management system for spare parts for un-programmed Maintenance activities					
7	There is a formal involvement of suppliers in the process of forecasting and Quantification.					
	Procurement Management					
8	We consider the 5Ps to be our key guide in supplier selection					
9	We consider Reliability and Flexibility to be important in supplier selection.					
10	We give equal opportunity to all prospective bidders by open tendering system and bids evaluation					
11	We have Implemented an EDI and world wide web for sourcing globally					
12	All purchase orders & contracts are serially and easy to monitor with supporting documentation					
13	Procurement process complains are documented					
14	Reconciliations for delivered items are always done in supplier presence.					
15	The purchases always reflect the purchase plan guided by budget					

	Operations Management	1	2	3	4	5
16	Well trained staff are employed to run the operations of the plant					
17	We have quality Management system that ensures the electricity availability is in place.					
18	Our operations efficiency are easily measurable as per PPA					
19	We always meet our obligations as per the PPA.					
20	We always respond to our internal and external customer complains in time.					
21	We have a continuous improvement strategy to encounter electricity trips.					
22	We always fulfil our utilization factor.					
23	We always maintain the stated availability					
24	We have a maintenance schedules in place which are strictly followed					
25	We have a Environmental Management System audited regularly					
26	We have a quality management system audited regularly					
	Logistics Management					
27	We have a system of monitoring Materials and Spares in Transits e.g. Logistics Management System					
28	We have a lead-time schedule available for all programmed spares					
29	We have make use of returnable /reusable containers for our logistics					
30	All overseas orders have specific code used for easier identification and Location monitoring					
31	We have tools to measure performance of our 3PL providers					
32	Logisticians are constantly updated with the changing laws and their implications					
33	We have collaborative transport management with a complete database of all our suppliers and agents					
	Supply Chain Performance Measurements					
34	We have implemented Order cycle where all orders are monitored and suppliers are rated all the time					
35	We have implemented SCM Key Performance Indicators on which are reported every month					
36	There is bench marking of various functions of supply chain					
37	Balance Score Card is used in our organization					
38	SCOR model is implemented in our company					
39	Supplier Evaluation and re-evaluation is done on a continuous basis					

	Customer/Supplier Relationship Management	1	2	3	4	5
40	We believe that customer is very important to our business					
41	We have an elaborate system of gathering customer suggestions.					
42	My organization has a system for evaluating customer satisfaction.					
43	We vary our products and services are as per customer requirements.					
44	My organization greatly considers customer requirements in the delivery of services/products.					
45	We always consider our customers when making power generation decisions.					
46	We frequently make contacts to our customers in order to respond to complains.					
47	We have a dedicated call centre for customer service					
48	We always remind our customers of overdue bill for settlement					
49	We are visit our suppliers to ascertain Progress and real situations					
50	Suppliers have a freedom to visit us and discuss with us improvements					
51	We have an ERP system that has a customer relationship module for real time information to our customers					
	Information Technology (IT) for Supply Chain Management					
52	We have an ERP system that has a customer relationship module for real time information to our customers.					
53	We have automated all our materials and spare parts for in our warehouse by use of bar coding system.					
54	We have an VMI to manage our stocks which triggers our re-order points					
55	We have embraced e-sourcing and EDI in our supply chain management system.					
56	All supply chain information is stored in a centralized server and accessible by all supply chain stake holders.					