FACTORS RESPONSIBLE FOR THE INEFFECTIVE DISTRIBUTION OF ELECTRICITY SUPPLY IN MINNA METROPOLIS OF NIGER STATE.

BY

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2008/2/31515BT

DEPARTMENT OF INDUSTRIAL AND TECHNOLOGY EDUCATION,

FEDERAL UNIVERSITY OF TECHNOLOGY, MINNA.

OCTOBER, 2012

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A RESEARCH PROJECT SUMMITED TO

THE DEPARTMENT OF INDUSTRIAL AND TECHNOLOGY EDUCATION, SCHOOL OF SCIENCE AND SCIENCE EDUCATION, FEDERAL UNIVERSITY OF TECHNOLOGY, MINNA.

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OCTOBER, 2012

CERTIFICATION

I ANJORIN, OLANREWAJU Matric No: 2008/2/31515BT an undergraduate student of the Department of Industrial and Technology Education certify that the work embodied in this project is original and has not been submitted in part or full for any other Diploma or Degree of this or any other university.

Name	**Signature – Date**

APPROVAL PAGE

This project has been read and approved as meeting the requirement for the award of B. Tech. degree in Department of Industrial and Technology Education, School of Science and Science Education, Federal University of Technology, Minna.

Supervisor	**Signature and Date**
Head of Department	**Signature and Date**
External Examiner	**Signature and Date**

DEDICATION

This work is dedicated to the Almighty God for his divine providence, Love, and blessings upon my life. Then, evergreen memory of my lovely late father Chief Anjorin Pelumi may almighty God grant him mercy in Jesus name, Amen. Also, to my brothers and sisters, Foluke, Tanwa, Adelaja for your kind and moral support for the success of my study.

ACKNOWLEDGEMENT

Praise be to Almighty God the Lord of the world. Who created me and sustained my health and give me ability to write this project. My special thanks and unparalleled appreciation goes to my able supervisor Mr. E. Raymond for his guidance and assistance given to me in the period of the study. May our good God bless your family. I wish to express my gratitude to the Head of Department of Industrial and Technology Education in person of Dr. E. J. Ohize, project co-ordinator in person of Mr. T.M. Saba, and all the staff of ITE Department Federal University of Technology, Minna, Niger State for there support throughout my academic period, and all colleagues and wishers. May God bless you all.

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ABSTRACT

Industrial and Technology Education is aimed at equipping the individuals with requisite technological literacy skills, which will enhance their relevance and functionality in the society. This study is designed to assess the factors responsible for the ineffective distribution of electricity supply in Minna Metropolis of Niger State. Three research questions and three null hypotheses were formulated to guide the study. A descriptive survey method was used for the study with a population of 70 PHCN management staff and 180 consumers of electricity in Bosso Local Government Area of Minna Metropolis of Niger State, which gives the total of 250 respondents. Frequency count, mean score method, standard deviation and t-test statistics were used for the data analysis. A response of 2.50 was used as an acceptable value for the mean respondents while the hypotheses were tested at 0.05 level of significant. Some of the findings were; environmental factor like weather in the raining season affect electricity supply, quantities such as voltage rate, oil level in transformers, switch gear conditions are not well observed, suitable distribution network should be laid down, the need for Independent Power Plant, and the need for automation in the distribution of electricity. It was recommended among others that; a suitable distribution network capable of meeting consumer needs with adequate generation of electricity should be laid down and automated

CHAPTER ONE

INTRODUCTION

Background of the study

The Power Holding Company of Nigeria (PHCN), formerly the National Electric Power Authority (NEPA) is an organization governing the use of electricity in Nigeria. It is obvious that the Power Holding Company of Nigeria (PHCN) lacks competition due to the monopolistic nature of the organization. This observation came into being through the idea of the research carried out by Asia Pacific Research Centre (2001).

PHCN which formerly started from Public Works Department (PWD) in 1986, and the pattern of electricity development was in the form of individual electricity power undertaking scattered all over the towns. In 1950, the Electricity Co-operation of Nigeria (ECN) ordinance no 15 which is similar to PWD, was put in place to power development and make it effective and thus bringing them under one body or under one control, all the various electricity undertakings in Nigeria and furthermore to cope with an increase of electricity demand by consumers due to the upsurge of economic activities. After Nigeria's Independence, the ECN and Niger Dam Authority (NDA) were merged to become the National Electric Power Authority (NEPA) with effect from the 1st of April (1972). The actual merge did not take place until the 6th of January 1973 when the first General Manager was appointed. Despite the problems faced by NEPA, the Authority has played an effective role in the nation's socio-economic development thereby steering Nigeria into a greater industrial society. The Niger Dams Authority (NDA) was established to support the Kanji Dam on River Niger which was commissioned in 1968 to become the first hydro-electric power station (Shehu 2008).

PHCN (2010), and Shehu (2008), observed: The NDA generated electricity, while the ECN distributed it to the consumers. Then in April 2005, due to the reformation of power sector, the name National Electric Power Authority (NEPA) was changed to power Holding Company of Nigeria (PHCN) through the privatization which is where we are today. PHCN is operating in geographical locations that are not served by any other companies in the aspect of distribution, generating, transmission of electricity supply. Theraja and Theraja (2007) stated that favorable electricity distribution and transmission would be made to cover expected future loads and to complete the on-going power plant project in the location of an industry of which the PHCN of Minna Metropolis is not an exemption in the consideration of this factors in order to meet the consumers need in the metropolis of Niger State.

Due to the shortage of electricity power supply in Minna Metropolis of Niger State, it is obvious despite the investment by the state government in purchase and distribution of transformers to various locations in different Local Government Area (LGA) with the metropolis to correct the present conditions or situation in order to meet the need of the people's. However, this project is carried out to identify the problems based on the understanding of the causes of the ineffective distribution of electricity supply in Minna Metropolis of Niger State and to look into the effective load of management technique and more also to eliminate the factors responsible for the ineffective distribution of electricity in Minna Metropolis of Niger State and to look into the effective load management technique and utility service factors to eliminate the factors responsible for the ineffective distribution of electricity supply in Minna Metropolis of Niger State.

Statement of the Problem

Regular power supply is the prime mover of technological and social development. There is hardly any enterprise or indeed any aspect of human development that does not require energy in one form or the other. The problems confronting the PHCN in Minna Metropolis are enormous, for instance Ajanaku (2007) stated that, the problem faced by PHCN system were shortage of trained supportive staff, trained administrative staff, and lack of supply of enough equipment. Adegbamigbe (2007), also mention that the techniques used by the executive director of the PHCN, do not encourage initiative among the staffs. He equally stated that many staffs are not willing to accept change in their method of distributing and transmitting of electricity supply in Minna metropolis of Niger State. From the above literatures, the opinion of the professional above seems to be continuous unabated.

Considering the fact that hydro power plants situated in Niger state generates over 1900MW of electricity, Minna the capital city of Niger state, is supposed to enjoy effective distribution of electricity supply in its metropolis and environs. But this expectation seems fetched.

While the Indian Institute of Planning and Management (2006) also said that there should be a continuous power supply in order to increase the development of the region thereby providing opportunities for local employment, provision of better health services and infrastructural facilities such as hospitals equipment, and computer education. This will serve as a benefit for the interest of the electricity board not to the customers alone because as the customers pay their dues which will be in turn to generate more funds to be used to maintain and upgrade the equipment used in supplying and distribute the electricity.

This will also be on opportunities for the rural house wives in the metropolis, will be able to use electrical appliances like fridge and electric cookers etc.

In view of the foregoing observation, it becomes necessary to examine these problem in detail, hence the need to assess the factors responsible for the ineffective distribution of electricity supply in Minna metropolis of Niger state.

Purpose of the Study

The purpose of the study is to assess the factors responsible for the ineffective distribution of electricity supply in Minna Metropolis of Niger State. The study:

1. Identified infrastructural challenges militating against effective distribution of electricity supply.
2. Identified management challenges militating against effective distribution of electricity supply.
3. Identified strategies for improving distribution of electricity supply in Minna Metropolis of Niger state.

Significance of the Study

The finding of the study is of enormous benefit to the state government in knowing the adoptable measures and necessary equipment and materials needed to improve on the practical content for effective distribution and transmission of electricity in Minna Metropolis of Niger State as a way to achieve the Millennium Development Goal (MDG).Thereby creating room for industrial growth through industrialization, increase in commercial activities by small, and large scale business and good standard of living that will be the benefit of the consumers. It is hoped that the findings of this study will help the PHCN to identify the relevance needs of the consumer and the actual voltage or load used by consumers including the load management

techniques, company to be adopted in ineffective distribution of electricity supply. This is to say that director of PHCN without the necessary qualification should not be employed to take charge of impacting knowledge to the staffs because they do not possess the necessary skills needed for standard effective distribution of electricity supply in Minna Metropolis of Niger State which in turn affects the staffs' performance. To buttress the fact, everyone that uses electricity either small or large scale, is a consumer of electricity and therefore will benefit from this study because it will highlight on the strategies to be adopted in order to provide effective distribution and transmission of electricity supply to the teeming populace of Niger state in particular and Nigeria at large.

Scope of the Study

This study focused on the assessment of factors responsible for the ineffective distribution of electricity supply within the environs of Minna Metropolis of Niger State. The study is conducted to assess the ineffective distribution of electricity supply with view of finding out the constraints and effective load management techniques to enhance the distribution of electricity.

Assumption of the Study

The following assumption was made for the study.

1. That the staff of PHCN Minna, Niger State will be sufficient to obtain relevant data necessary for answering the research questions.
2. That the responses of respondent are considered relevant idea to provide valid information that will give authentic data for this research work.

Research Questions

The study answered the following research questions.

1. What are the infrastructural challenges militating against effective distribution of electricity supply in Minna Metropolis of Niger State?
2. What are the management challenges militating against effective distribution of electricity supply in Minna Metropolis of Niger State?
3. What are the strategies for improving distribution of electricity supply in Minna Metropolis of Niger State?

Hypotheses

The following hypotheses were formulated, and were tested at 0.05 level of significant.

$H_{01.}$ There is no significant difference between the mean responses of the PHCN management staffs and the consumers of electricity on the infrastructural challenges militating against effective distribution of electricity supply in Minna Metropolis of Niger State.

H_{02}. There is no significant difference between the mean responses of the PHCH management staff and the consumers of electricity on the management challenges militating against effective distribution of electricity supply in Minna Metropolis of Niger State.

$H_{03.}$ There is no significant difference between the mean responses of the PHCN management staff and the consumers of electricity on the strategies for improving distribution of electricity supply in Minna Metropolis of Niger State.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

The study was reviewed under the following sub-headings:

- Historical Background of Electricity Development in Nigeria.
- Generation, Transmission and Distribution of Electricity Supply in Nigeria.
- Infrastructural Challenges Militating Against Effective Distribution of Electricity Supply.
- Management Challenges Militating Against Effective Distribution of Electricity Supply.
- Strategies for Improving the Distribution of Electricity Supply.

Historical background of electricity development in Nigeria

The historical development of electricity supply in Nigeria can be traced back to the end of the 19th century when the first generation power plant was installed in the city of Lagos state of Nigeria in 1898, after it was introduced in England (Niger power review 1985). The standard capacity of electricity in use at that particular time was 6kw because the power demand maximally at that time was less than 60kw. In 1946, the pattern of electricity development was in the form of individual electricity power undertaking scattered all over the towns. Some of the few undertaking for electricity supply was Federal Government bodies under the Public Works Department (PWD) to be in charge of the electricity supply in Lagos state. By 1950, in order to integrate electricity supply and make it effective, the Colonial Government passed the ECN ordinance no.15 of 1950. With this ordinance in place, the electricity department and all those undertakings which were controlled come under one body. A central body was established in 1950 by the Nigeria Government which transferred electricity supply and development to the care of Electricity Corporation of Nigeria (ECN). The ECN and the Niger Dam Authority (NDA)

were merged to become the National Electric Power Authority (NEPA) with the effect from the 1st of April 1972. The actual merged did not take place until the 6th of January 1973 when the first general manager was appointed. Despite the causes or problems faced by NEPA, the newly established authority (NDA) was responsible to construct and maintain Dam and other works on the River Niger to generate hydro-electricity, to improve navigation and give effective role in the nation's socio-economic development thereby steering Nigeria into a greater industrial society (Manafa,1995). In addition, after Nigeria's independent in 1960, the Niger Dam Authority came into existence in Niger state located at kainji on River Niger in 1968 which became the first hydro-electric station for power generation in Nigeria. The arrangement then was that of the NDA which generated the electricity, and the ECN which distribute it to the consumers. By this, National Electric Power Authority (NEPA) by the decree no.24 in 1972 will be responsible for the generation and distribution of electricity supply at the same time in Nigeria because formerly, the ECN was mainly responsible for the distribution and sales of electric power to customers while NDA generated the electricity by building generating stations and running transmission lines.

The major factors for merging ECN and NDA together were:

1) Is to develop and maintain an efficient co-ordinate and economical system of electricity supply throughout the Federation.
2) The integration of ECN and NDA state that the monopoly of all commercial electric supply shall be enjoyed by NEPA to the exclusion of all other organizations in the country (Niger Power Review, 1998).

When NEPA began, the authority kept on expanding annually to meet the upsurge demand of the consumers. But with luck not being on our side, many of the Nigeria citizens have no access to

electricity and to the ones, who have the access to electricity, were experiencing an irregular power supply (Madueme and Okoro 2004). This shortage syndrome, has made the Federal Government to embark on a serious power reform intending to review NEPA to make it to be well organized and effective in response to the continuous growing of electricity supply to the teeming populace which made NEPA in April 2005, was changed to Power Holding Company of Nigeria (PHCN) as a result of reformation of the power sector (Power Holding Company of Nigeria 2010). The reformation of the power sector was due to the inadequate effective electricity supply, incessant power outages, and high technical and non-technical loses present in the Nigeria electricity industry because it is believed that the reformation through the privatization of NEPA, will bring effective change or positive change for the distribution and transmission of electricity supply.

Electricity Generation in Nigeria

Despite Nigeria vast oil wealth, much of the country's citizens do not have access to uninterrupted supplies of electricity. Nigeria has approximately 5,900 (mw) as at 2006 of installed electric generating capacity. Power outages are frequent and the power sector operates below its estimated capacity. A fundamental reason offered is the low generating capacity of the Nigerian power sector relative to installed capacity. Consequently, the sector had to undergo some reforms to increase power generation, transmission and distribution. Among the reforms is the setting up of the National Electricity Regulatory Commission (NERC), unbundling of PHCN and entry of Independent Power Producers (IPP) among others (Omotosho, Alaoji, 2006). The reformation of the power sector by the Nigeria government has made an effort to increase power generation and also residential electricity demand in Nigeria. The Nigeria economy is heavily dependent on energy. Electricity is a vital source of energy used for a number of purposes that

include industrial, commercial and household purposes. But on the other side, it leads to an increase in energy requirement due to its well noted significance in modern industries (Theraja, 2007). The electricity in discussion, stipulated from different sources in Nigeria. Such sources include Hydro-electricity (from water pressure), steam nuclear and geo-thermal energy, are sources of energy that produces electricity from heat energy (Sanni, 2010). Electricity generation is an integral part of transmission, and distribution which is very importance and better to understand when they are discussed together as a whole. But electricity is generated by generator converting the rotary motion of turbines into electricity which is the movement of electrons through metallic conductors. However, magnetism is the major factor in order to have effective change because when a conductor is allowed to pass through a magnetic field, current is in the conductor and the brushes are riding on the ship-rings to facilitate the collection of the current produced by the interaction between the magnetic field and the conductor. Since each side of the rotating coil cut across the magnetic field first in one way and on the order side, an alternating current (A.C) is induced in the conductors. The conductor is wound round a former which are better refer to as amateur conductors. It is the useful form of electricity that can be easily promote or transformed in to higher or lower voltages. A generator is important for the production of the larger amount of electricity by moving thousands of coils through an intense magnetic field. In a generator, the fixed coils are called the stator coils because it is wound round a stator and the revolving coils assembly which could cut across the fixed coils to produce current is known as the rotor coil because it is wound round a stator. The generator used to provide adequate power plants are operated at a constant frequency so that the alternating current cycles which is normally 50hz, should always be the same because an increase or decrease of the frequency can lead to increase or decrease of the electricity which may lead to failure of some

part of the system and it will also affect the public and private consumers of the electricity negatively in the country. Although the situations is improving with the used of magnetic field strength output is changed to regulate the electricity output because our home and industries require enough capacity of energy (Sanni, 2010). For better understanding of electricity supply, this table below shows the total electricity generated in Nigeria through the number of power stations, power plant types, location state, age (years), installed units, installed capacity (mw), units available are represented in the table below. The Total Installed Capacity of the currently generating plants is 7,876 MW (Table 1), but the Installed available Capacity is less than 4,000MW as at December 2009. Seven of the fourteen generation stations are over 20 years old and the average daily power generation is below 2,700MW, which is far below the peak load forecast of 8,900MW for the currently existing infrastructure. As a result, the nation experiences massive load shedding.

TABLE 1: EXISTING POWER GENERATION CAPACITY IN NIGERIA

S/No	PLANT	PLANT TYPE	LOCATION STATE	AGE (years)	INSTALLED UNITS	INSTALLED CAPACITY (MW)	UNITS AVAILABLE
1	Egbin	Thermal	Lagos	22	6	1320	4
2	Egbin	Thermal	Lagos	6	9	270	9
3	Sapele	Thermal	Delta	25-29	10	1020	1
4	Okapi	Thermal	Cross River	2	3	480	2
5	Afam	Thermal	Rivers	25	20	702	3
6	Delta	Thermal	Delta	17	18	840	12
7	Omoku	Thermal	Rivers	2	6	150	4
8	Ajaoku	Thermal	Kogi	Na	2	110	2
9	Geregu	Thermal	Kogi	1	3	414	3
10	Omoto	Thermal	Ondo	New	8	335	2
	SUB-TOTAL (THERMAL)				**93**	**5976**	**44**
12	Kainji	Hydro	Niger	38-40	8	760	6
13	Jebba	Thermal	Niger	24	6	540	6
14	Shiroro	Thermal	Niger	22	4	600	2
	SUB-TOTAL (HYDRO)				**18**	**1900**	**14**
	GRAND TOTAL				**111**	**7876**	**58**

TABLE 2: PLANNED TOTAL PRESENT AND FUTURE ELECTRICITY GENERATION INFRASTRUCTURE IN NIGERIA

S/N	POWER STATION	TYPE	STATE	CAPACITY (MW)	STATUS
1	Egbin	Thermal	Lagos	1320.00	Existing
2	Afam	Thermal	Rivers	969.60	Existing
3	Sapele	Thermal	Delta	1020.00	Existing
4	Ijora	Thermal	Lagos	40.00	Existing
5	Kainji	Hydro	Niger	760.00	Existing
6	Jebba	Hydro	Niger	578.40	Existing
7	Shiroro	Hydro	Niger	600.00	Existing
8	Delta	Thermal	Delta	912.00	Existing
9	Orji	Coal	Rivers	20.00	Existing
10	Geregu	Thermal	Kogi	414.00	Ongoing
11	Omotosho	Thermal	Ondo	335.00	Ongoing
12	Papalanto	Thermal	Ogun	335.00	Ongoing
13	Alaoji	Thermal	Abia	504.00	Ongoing
14	Omoku	Thermal	Rivers	230.00	New IPP
15	Rain/Ube	Thermal	Bayelsa	225.00	New IPP
16	Sapele	Thermal	Delta	451.00	New IPP
17	Eyaen	Thermal	Edo	451.00	New IPP
18	Egbema	Thermal	Imo	338.00	New IPP
19	Caliber	Thermal	Cross River	561.00	New IPP

20	Mambilla	Hydro	Taraba	2600.00	New
21	Zungeru	Hydro	Niger	950.00	New
22	AES	Thermal	Lagos	300.00	Commissioned
23	AGIP Okpai	Thermal	Delta	480.00	IPP Commissioned
24	Omoku	Thermal	Rivers	150.00	IPP Approved IPP
25	Obajana	Thermal	Kogi	350.00	Approved IPP
26	Ibom Power	Thermal	Akwa Ibom	188.00	Approved IPP
27	Ethiope Energy Ltd			2800.00	Approved
28	Farm Electric Supply Ltd			150.00	Licenses IPP Approved
29	ICS Power			624.00	Licenses IPP Approved
30	Supertek Ltd			1000.00	Licenses IPP Approved
31	Mabon Ltd			39.00	Licenses IPP Approved
32	Geometric Ltd			140.00	Licenses IPP Approved
33	Aba Power Ltd			0.00	Licenses IPP Licensed
34	Westcom Tech & Energy Service Ltd			1000.00	Distributor License Granted IPP

35	Lotus & Bresson Nig Ltd	60.00	License Granted IPP
36	Anita Energy Ltd	136.00	License Granted IPP
37	First Independent Power Co Ltd	95.00	License Granted IPP
38	First Independent	150.00	License Granted IPP
39	Hudson Power Station Ltd	200.00	License Granted IPP
40	Ibafo Power Station Ltd	640.00	License Granted IPP
41	Shell Distribution Coy Ltd	100.00	License Granted IPP
42	Agbara Shoeline Power Co Ltd	1800.00	License Granted IPP
43	Index thermal power Ltd	1800.00	License Granted IPP
		24,106.00	

Source: Power Holding Company of Nigeria PLC. Head Quarters Abuja

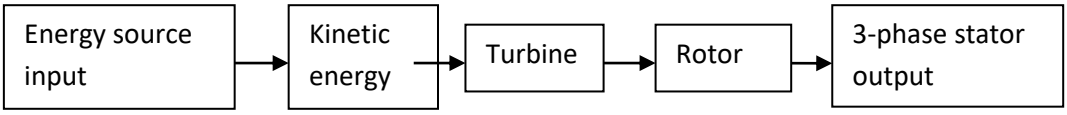
Sources of Electricity Supply in Nigeria

The major Sources of electricity are the Hydroelectric Power which is produced from water when water pressure is used to produce electricity supply and the power plants used are called hydroelectric plants. Water power is produced from a large settlement of water called dam equipped with flood gate. The water coming from behind the dam is not allowed to come straight through the intake gate and also not allowed to flow to a large pipe called the penstock to the turbine. This is done in order not have difficulty or obstacles that are liable of causing any

damage when they are accidentally allowed to flow directly without screening. The water pressure from a potential state, is allowed to fall from a height gaining kinetic energy which its flow into the penstock is controlled by the flood gate to drive the turbine upon which is units of generators coupled usually consisting of vertical shafts with the generator rotor located above and the turbine below it. But instantaneously, the turbine is energized by a set of battery to reach a frequency and the water pressure is allowed to continue the driving to 50Hz because it is easier to obtain the rotary motion in this form (Sanni, 2010).

Steam Energy: power from steam energy, is comprises of all electrical power that are thermally generated from heat as we have in coal, diesel etc. While the thermally energy is converted into steam energy which create pressure in a tube to drive rotors in a static magnetic field to cut across the magnetic flux for the induction of current to produce electricity as it has earlier being discussed in the generation of electricity.

Generalized block diagram of turbine generators.



Energy-source input.

The type of energy input describes the type of generator. In an Hydro-system water is used as the source of energy, in Thermal the sources of energy are fuels such as coal, oil and gas. Finally in a nuclear system, uranium is the source of energy.

Kinetic energy

The energy-input is processed appropriately to produce kinetic or mechanical energy. In a Hydro-system the water is forced through some large pipe, thereby producing water-current as

kinetic energy. In Thermal and Nuclear system, the energy-input is respectively processed to produce steam-current as kinetic energy.

Turbine

This is a mechanical device akin to the shape of a propeller. The appropriate turbine is designed and manufactured to cope with the type of kinetic energy applied to turn the turbine.

Prime movers

A combination of energy-input, kinetic energy and turbine is known as a prime mover. A prime mover is an arrangement that provides mechanical power input to a generator.

Rotor

The turbine is mechanically coupled to the rotor of a three-phase generator, such that the rotor turns along with the turbine.

Stator

As the kinetic energy rotates the turbine-rotor coupled, a three-phase electrical power is delivered at the starter as output of the generator. The three-phase conductors are identified as the Red-phase (R-ø), Yellow-phase (y-ø) and Blue-phase (b-ø). In Nigeria electrical power is generated at 11kv per phase, at a frequency of 50Hz.

Transmission of electricity supply

In majority of cases, an electrical power generation station is located a long distance away from the consumers. In view of this, the power must be transmitted or send to the location(s) of use. Electrical power transmission, therefore, can be defined as a bulk- carriage of electrical power from a generation station to a substation, the substation being located in the vicinity of the consumers. The means of transmission are cables and bane-wines, known as

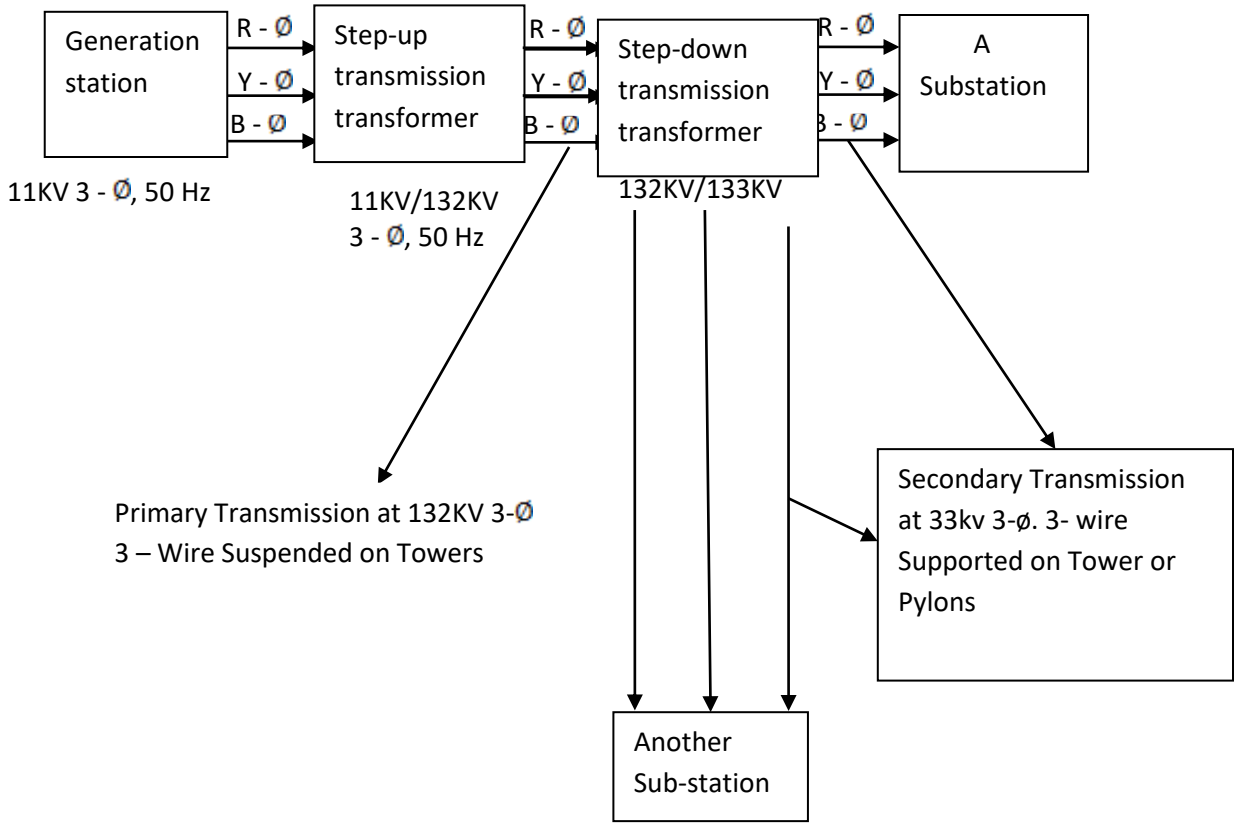
transmission lines. That is, a cable for R-Ø, another cable for Y-Ø and finally a third cable for the B-Ø.

Two methods are used in transmitting electrical power:

1) Underground system
2) Overhead system

In Nigeria, overhead system is employed. The transmission lines are bare aluminum conductors, one for R-ø, one for the y-ø and one for the B-ø. The three wires are suspended on towers or pylons along the route to the substation.

Caven (1992) described transmission lines with different load services at different points. The table below shows the block diagram of overhead power transmissions from a generating station to a substation.



The Block Diagram Analysis

At the generating station, the 11kv 3-ø is connected to a step-up transmission transformer, and this increases the power to 132kv 3-ø, 50Hz. The three aluminum wires of the phases are therefore supported on metal towers spotted to the location of a step-down transmission transformer. The transformer decreases the power from 132kv to 33kv. The transmission from the 11kv/132kv transformer (at the generating station) to the location of the 132kv/33kv transformer is known as primary transmission. From the step-down transformer the 33kv three wires are supported on towers or masts to a substation. Depending on the amount of power generated and transmitted a number of 33kv.3-ø; 3-wire may be tapped from the step-down transformer for transmission to other substation, located in other cities or towns. Finally, the transmission from the 132kv/33kv step-down transformer to a substation is known as secondary transmission.

Distribution of Electricity Supply

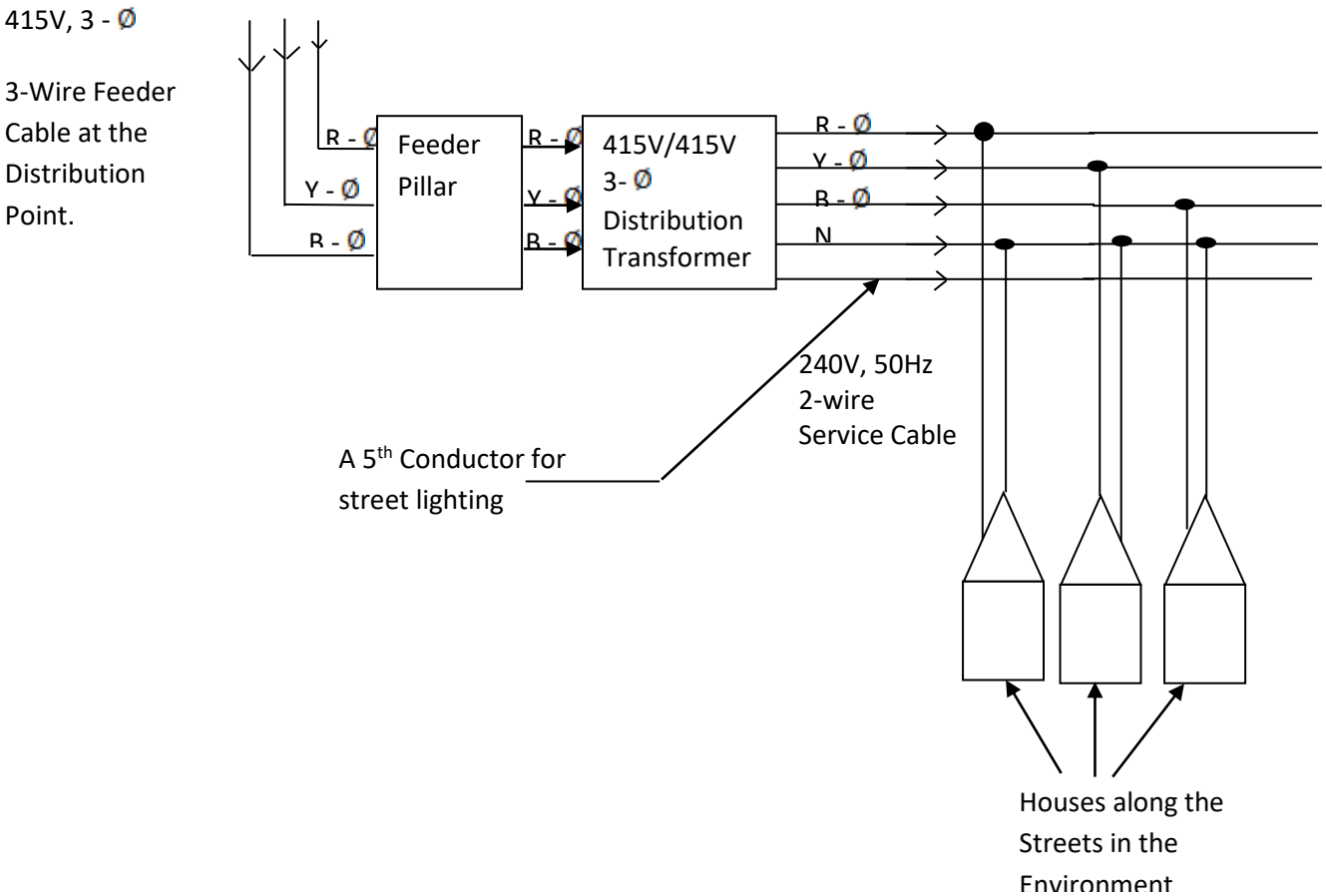
Electrical power distribution is defined by Patrick (1997) as the supply of electrical power from a substation to various local consumers. Note that a 415v. 3-ø, 3-wire distribution from a substation to a consumer is known as secondary distribution. There are two systems used in distributing electrical power. These are: underground and overhead. In Nigeria, overhead distribution system is adopted.

For instant a light-load consumer, the three aluminum conductors of the 415v, 3-ø in the substation, are carried on cement poles to a distribution point located in the vicinity of the consumer. At the distribution point the three phases are dropped with a feeder cable and terminated on a feeder pillar. From here the 415v.3-ø, 3-wire is fixed to a 415v/415v transformer. The transformer ensures restoration of any voltage loss due to the distribution

distance from the substation. The output from the transformer is 415v.3-ø, 4-wires, the four wires being identified as R-ø, Y-ø, B-ø and neutral (N).

In the case of a closed consumer such as a large institution, the four wires are fed to a three-phase energy-meter. In addition, the three phases are usually further controlled in the consumer's private substation. The four wires are then carried on the customer's poles, to supply the various activities in the environment of the consumer. Note that a fifth aluminum conductor is usually added on the consumer's poles. This is used to provide street lights in the environment.

The illustration below gives the Summation of a Block Diagram of Power Distribution and Connection in a Typical Residential Community.



The Block Diagram Analysis

The three overhead aluminum conductors convey the 415v 3-ø from the substation to a distribution point within the community. The distribution in Nigeria covers the voltage of 33kv to 240v. In the power distribution, the equipments used are set to function to their maximum capacity even when they are subjected to their maximum load for power delivery without failure. At the point, a 3- cove feeder cable (or three separate feeder cables), is used to drop the power from the last distribution pole to a feeder pillar (on the ground) from here the 415v, 3-ø, s-wire is transformed to 415v, 3-ø. 4-wire, i.e., R-phase(r-ø),yellow-phase (y-ø), blue-phase(B-ø) and neutral (N). Thereafter, a four-core feeder cable (or four separate feeder cables) is used to connect the transformer secondary (415v.3-ø 4- wire) to a first community pole at the distribution point on the pole, the four cables of the transformer secondary connect four aluminum conductors. At this junction a fifth aluminum conductor is added to the first community pole, this being used to provide street lighting for the community. The five aluminum conductors are extended from the first pole to other poles along the streets of the community.

For domestic consumption a residential building is normally supply with a single-phase of 240v, 50 Hz. The supply is implemented by connecting such building with two service cables at the nearest community pole. One of the cables is connected to one of the three phases, while the other cables are connected to the N-conductor. With this method of connection the building is thus supplied with 240v, 50 Hz. The connection is effected by twisting the conductors of the service cables to the bare aluminum conductors. Note that national electric power authority (NEPA) technicians carryout a community connections such that load-current on the three phases are balanced in the distribution transformer, the balance being ensured by connecting the building to different phases. These conductors are usually made of aluminum what is cheaper to

afford compare with the rest of the conductors and its light weight makes it more suitable for use than any other conductor in transmission and distribution lines. Other types of conductors are copper, silver and gold which are more expensive. The conductors are usually coded for a quick identification red, yellow, blue, green, and brown in the case of four-phases and lastly, black which is the neutral.

In addition the distribution network to consumers, the various classifications of voltage ratings are given below from thee least in ascending order.

- Extra-low voltage…… ranging between 30-50v
- Low voltage…… ranging between 50-250v.
- Medium voltage…….. ranging between 250-650v
- High voltage……. Ranging between 650-3000v.

All of which are alternating current (A.C) supply.

Causes of Ineffective Distribution of Electricity Supply

The supply of power network that generally concerns the common man is the 11kv distribution network lines or feeders downstream of 33kv substation. The 11kv feeder, from the 33kv substation which branches further into subsidiary.11kv feeders to carry power close to the load points, where it is further stepped-down by the transformers in proximity to consumers into 240v or 415v. It is important to note that, the effective use of this system used to convey electricity does not give room for quick fault detection, isolation of faulty region and restoration of supply to the maximum outage area. This is usually used to include all faulty and faultless areas as long as they are fed by the same feeder line. The absence of switches installed at different points in the distribution network, will make it difficult to isolate certain loads when necessary such as the isolation of faulty areas in order to restore the power of the unfaulty areas.

The only option left with the distribution network, is the circuit breaker installation to be made for every main point of 11kv feeder at the 33kv substation. A substation is an open-air space where electrical power is processed and distributed to consumers. However, the circuit breakers are not originally made for this purpose. The circuit breakers are provided to completely isolate the downstream network in the event of any faulty. By the use of a circuit breaker as tools for local management technique is not desirable because it largely disconnects Avery large consumer segment. This is clearly saying that a system that can help and achieve a final resolution in load management is needful in order to minimize the risk of power shortages in the distribution and transmission network (Theraja, 2007).

Infrastructural Challenges Militating Against Effective Distribution of Electricity Supply

Regular Power Supply is prime mover of technological and social development all over the world today. There is hardly any enterprise or indeed any aspect of human development that does not require energy. Nigeria as a country consistently suffers from energy shortage-a major impediment to industrial and technological growth. The Power Holding Company of Nigeria (PHCN) has the sole responsibility for managing the generating plants as well as distribution of nationally. The National Electricity and Regulatory Commission is assigned the responsibility to establish or approve appropriate operating codes and safety, security, reliability and quality standards and to monitor the operation of the electricity market (Owan,2005). Several reasons have been adduced on why the various efforts in providing adequate infrastructural for electricity generation has been a bottleneck in the power sector of Nigeria. The following reasons are the challenges of providing standard and adequate infrastructure which in turn militating against distribution of electricity supply.

Firstly, is the constant canalization and attack on Escravos gas pipelines especially Chanomi Creek in Delta State by militating groups operating in the Niger Delta. The channel is feeding Eglin Thermal Station. Another pipeline, Escravos Lagos Pipeline owned by the Nigeria Gas Company (NGC), which feeds Aram with gas has been vandalized several times over. This has brought power generation to all time low (Nwachukwu, 2007).

Secondly, PHCN is indebted to NGC in the sum of N7billion for gas supplies. To recover their money NGC several times had to halt supply of gas to the organization to recover the debts (Aster, 2007).

Thirdly, besides the low gas supply to the thermal stations, the worst and major cause is the activities and conduct of the PHCN personnel. This age long problem in the sector persists in the organization. For instance, those personnel in the marketing Department hardly read the meter. Billing in such cases is largely by estimation. The result is often spurious bills. In some cases where bills are estimated instead of the actual consumption, most of the consumers are often hostile to the officials or personnel of the organization. Some even refuse out rightly to settle such bills, claiming that they cannot pay for services not rendered (Ikechukwu, 2005; Agbo, 2007; Johnson, 2007). Further, the problem of power supply is traceable to the usual gross inefficiency and bureaucracy that are evident in most parastatals. Sabotage is also a significant factor. High tension linesand transmission and generating equipment components are stolen regularly. Revenue collection is poor and the greatest debtors are government establishments and parastatals (Adegbamigbe, 2007).

Furthermore, PHCNs performance is being plagued by natural adversities like erosion and seasonality of tropical rain. Erosion washes off sand silt by corroding the base of high voltage equipment in Gombe, Maiduguri and Abakaliki areas of the North and East of Nigeria,

respectively. Other operational problem has been associated with low water level periodically experienced at Kainji, Shiroro and Jebba stations in savanna region of the country. The low water level affects the generation and supply of electricity through the thermal stations especially during the dry season. Another problem confronting PHCN is the low investment in power generation over the years. All the plants are very old. Thirty six percent of them are over twenty five years old, 48 percent are over twenty old, and no new plant has been installed in the last fifteen years prior to the advent of civilian administration in 1999. With this it is pertinent to note that the power supply situation in the country has not improved in the last eight years despite huge investments government claimed to have made on it4. However, because of its dismal performance, plans are underway to restructure and privatize PHCN (Agbo, 2007). Frustrated and provoked by PHCN's crazy bills, ineptitude, dismal performance plaguing the organization and the spate of corruption going on, it understandable why public disenchantment against the performance of the sector has increased over the years (Ameh, 2006; Arowolo, 2006).

In addition, the power supply in virtually all the sates in Nigeria has been very dismal. For instance, in Benue State, only Makurdi the state capital receives electricity supply for about five hours a day. Also in Delta State some communities never had power supply for upwards of six months. In Lagos, the in commercial nerve centre of the country, the situation is also bad as power supply in many residential parts of Lagos is about four hours per day with cuts at short intervals. It is a total black out in some areas for about three days or more (Akpan, 2005; Odiaka, 2006; Ogunmodede, 2006).

Management Challenges Militating Against Effective Distribution of Electricity Supply

Incessant power failures have caused irregular production and low utilization of resources in industries and educational institutions while the Nigerian government has also been embarrassed on several occasions when Power Holding Company of Nigeria (PHCN) switched off power during government official functions. This problem is basically due to poor management of electricity in Nigeria. The following are the major factor militating against the management of effective distribution of electricity supply.

Firstly, Poor maintenance of equipment, our empirical study reveals that the generating units and their auxiliaries have become obsolete while poor maintenance culture of the organization has immensely contributed to the nagging erratic power failure in Nigeria. For instance, the Kainji Power Station commissioned in 1968 is yet to undergo a full turn around maintenance (TAM). The plant with an installed capacity of (760 MW) generates only (580 MW). Other power plants like Egbin (1320 MW) and Ijora with a combined capacity of 3153 MW also need routine repairs.

Secondly, Bureaucratic corruption, the corruption perpetrated by the staffs of the Authority who may connive with the customers in order to evade payment of PHCN bills endangers PHCN performance. The PHCN officials pretending to act for the organization collected money from customers for supply of prepaid meter yet they refused to supply the meters and thus damaging the tone and image of the organization.

In sum, all the above environmental factors (internal and external) constitute a clog in PHCN performance to supply adequate and stable electricity to residential, commercial, industrial and governmental agencies in Nigeria. This, in effect substantially upholds our theoretical assertion made at the beginning of this paper that ecological factors go along way to

determine the level of performance, efficiency and effectiveness of an organization. In order to overcome environmental factors hindering stable power supply in Nigeria.

Thirdly, Non-settlement of electricity bills, the non-settlement of electricity bill issued by PHCN to its customers has been identified as a major environmental factor that weighs down the performance of PHCN. The paradox of this huge indebtedness is that government parasitical and agencies are notorious with the highest unpaid bills. The total indebtedness which stood at N12, 477,442,811.00 is very disturbing. This indebtedness has also been identified (Obadan, 2000) when he said: "PHCN was crippled by its customers' indebtedness; its privatization can start with the employment of private companies to collect tariffs on its behalf". There is no reason doubting the fact that prompt payment of PHCN bills may likely enhance regular power supply and reduce PHCN‟s ineptitude as earlier identified in this paper. This will enable it to fund the (TAM) Turn around maintenance of its machines as when due.

Strategies for Improving Distribution of Electricity Supply.

From all indications the performance of power sector in Nigeria as represented by PHCN activities in the last eight years has been dismal and, by extension, accentuated the economic and industrial underdevelopment situation of the country. It shows that Nigeria as developing country is not even at the stage of take off since the stage would imply that basic infrastructural facilities are in place. Considering the strategic importance of this sector in socio- economic development of the country and with the attendant problems that have characterized it, it appears that public-private partnership in virtually all aspects including generation, transmission and distribution seems to be the better option now rather than outright privatization. To achieve these, following steps must be taken into consideration.

Firstly, competition and appropriate regulatory framework which are prerequisites to achieve better services delivery must be put in place. Competition should be promoted by introducing functional segmentation by separating transmission companies; the establishment of a number of competing privately owned generation companies from existing PHCN generation facilities and the opening of a number of distribution and marketing companies.

Secondly, because of the strategic importance of power sector and as a result of security concerns, it will be ill advised for government to opt out of the sector completely. Provision of uninterrupted power supply should be seen as part and parcel of social services provided by government to the masses. However, in advocating public-private partnership, affordability and service delivery should be the watchword. Considering that in many places people are not connected to power supply and with emphasis on a vibrant informal sector, cottage industries and semi manufacturing it is obvious that much is still required to be done in the power sector to make this a reality.

Therefore if their rates are not affordable, the impoverished masses will continue to consume energy illegally or adjust their meter arbitrarily thereby making the parastatal to lose vital revenue required to keep its equipment in form.

Thirdly, another important issue government is expected to address is to pay adequate attention to is the legitimate concern of the workforce of the parastatal. In an emerging economy like Nigeria where there is massive unemployment, it is understandable if workers, for some obvious reasons oppose public-private partnership and privatization. Therefore to forestall labor unrest, there is the need to get all relevant stake- holders involved in the reform of power sector process. This will mitigate the political and social costs in restructuring and privatization of the sector. Against this background, there is the need to design and implement redundancy polices

transparently so as to provide fair and equitable treatment and compensations for all affected personnel. In this regard, the policy option may include; severance package, pension scheme, retraining of workers and employee share ownership scheme. Moreover, there is the need to re-orientate PHCN's personnel to work in parastatal that is commercially driven and consumer probity, productivity and efficiency and sanction reoccurring anti- customer behaviors. In addition, PHCN is one of the hotbeds of corruption in Nigeria, hence the need to establish anti-corruption and transparency units in the parastatal so that the activities of corrupt officials will be reduced to the barest minimum. Also members of the public should be sensitized to desist from offering bribes/ inducement to the PHCN staff as a way of securing favors or accelerated service. Generally the power sector in Nigeria should have been the engine for industrial and economic growth but unfortunately it has performed dismally despite huge investments made by government in the last eight years. It is expected that with coordinated private participation in power generation, transmission and distribution a lot of changes will occur in the sector. Hence, it is only when Nigeria can boast of uninterrupted power supply that one can truly say that the country has been set on the part to industrializations and technological development in line with the global demands.

CHAPTER THREE

METHODOLOGY

This chapter described the procedure that was used in carrying out the study under the following sub headings, Research Design, Area of the study, Population, Instrument for Data Collection, and Validation of instrument, Administration of the Instrument, Method of Data Analysis, and Decision Rules.

Research Design

This study employed the descriptive survey method because it involves the use of questionnaire to help in determining the opinion of the respondents. Ogungimi (2000) stated that a survey research as a descriptive study are plans, strategies and structured employed towards obtaining answers to research questions and hypothesis. He further added that it covers the outline of what the researcher intends to do up till the final analysis. In the same angle, this study seeks the opinion the PHCN management staff and the consumers of electricity on the Assessment of Factors Responsible for the Ineffective Distribution of Electricity Supply.

Area of the Study

This study was carried out in Bosso Local Government Area of Minna Metropolis of Niger State.

Population

The target population of the study comprises of 250 management staff of PHCN and consumers of electricity within Bosso Local Government of Minna Metropolis of Niger State. The PHCN management staff consists of 70 staff and the consumers of electricity in the chosen locality are 180 in Maikunkele Bosso Local Government of Minna Metropolis, Niger State, Nigeria.

Instrument for Data Collection

The instrument for data collection was a structured questionnaire developed by the researcher. The questionnaire consists of two sections A and B. B was further divided into 3 sub-sections as shown.

SECTION A: Dealt with the respondents personal data.

SECTION B: Consists 30 questionnaire items.

SECTION A: Dealt with the infrastructural challenges militating against effective distribution of electricity supply.

SECTION B: Dealt with the management challenges militating against effective distribution of electricity supply.

SECTION C: Dealt with the strategies for improving distribution of electricity supply in Mina Metropolis of Niger State.

Validation of Instrument

The questionnaire drafted by the researcher was validated by two lecturers in the Department of Industrial and Technology Education, Federal University of Technology Minna, for necessary correction.

Administration of the Instrument

The researcher administered the questionnaires to the respondents personally. With the help of the research assistant, the completed copies of the questionnaire were further administered to other respondents. The filled questionnaires were collected after four days by the researcher with assistant researcher's help.

Method of Data Analysis

The data used for this study were analyzed by using frequency count, mean score method, standard deviation and t-tested at 0.05 level of significant to agree or disagree on the respondent's opinion on a particular item contained in the instrument. The mean score of each item was computed by multiplying the frequency of each response mode with appropriate nominal value and divided by the sum obtained under each item with the number of the respondents to on item as show.

A four point rating scale was used to analyze the responses as seen below.

Strongly Agree (SA) = 4 points

Agree (A) = 3 points

Disagree (D) = 2 points

Strongly Disagree (SD) = 1 points

Mean: summing up the product of the frequency and nominal value of each option for response for each items dividing by the number of respondents of each items.

$\overline{\text{Means}}$ (X) = $\sum F \frac{X}{N}$ Where

$\overline{X}$ = Means Response of Each Item

$\sum$ = Summation.

F = Frequency.

X = Nominal Value.

N = Number Item.

$$\sum F \frac{X}{N} = \frac{4+3+2+1}{4} = \frac{10}{4} = 2.5$$

Standard Deviation

The standard deviation for each group of the respondents was computed in the Appendixes using the formula below:

$$\text{Standard Deviation (SD)} = \sqrt{\sum \frac{(X - Xg)^2}{N}}$$

Where S.D = Deviation Standard

X = Mean of each items

Xg = Grand mean of each items

N = Total number of all items

∑ = summation of items

F = Frequency of scores

t-test was used to compare the mean of each item of both PHCN management staff and consumers of electricity and to determine their responses.

The formula for calculating t-value is:

$$t = \frac{\overline{X_1} - \overline{X_2}}{\sqrt{\frac{(N_1 - 1){S_1}^2 + (N_2 - 1){S_2}^2}{N_1 + N_2 - 2}}} \left[\frac{1}{N_1} + \frac{1}{N_2}\right]$$

Where, t = Test of significant.

X_1 = Grand mean of PHCN management staff.

X_2 = Grand mean of Consumers of Electricity.

N_1 = Total number of PHCN management staff.

N_2 = Total number of Consumers of Electricity.

S_1 = Squared of PHCN management staff.

S_2 = Squared of Consumers of Electricity.

$N_1 + N_2$ = Degree of freedom.

Decision Rule

The mean of 2.50 was used as decision point for every questionnaire item. Consequently, any item with a mean response of 2.50 and above was considered to be agreed and any item mean score of 2.49 and below was considered disagreed.

For testing hypotheses at t-value of ±1.96 at 0.05 level 0f significant was chosen. So any value that has its t-calculated less or equal to the value was considered accepted and above t-value was considered rejected.

CHAPTER FOUR

PRESENTATION AND ANALYSIS OF DATA

This chapter deals with presentation and analysis of data with respect to the research questions and hypotheses formulated for the study.

Research Question 1:

What are the infrastructural challenges militating against effective distribution of electricity supply in Minna Metropolis of Niger State?

Table 3:

Mean Responses of PHCN Management Staffs and the Consumers of Electricity on the Infrastructural Challenges Militating against Effective Distribution of Electricity Supply in Minna Metropolis of Niger State.

$N_1 = 70$ AND $N_2 = 180$

S/NO	ITEMS	$\overline{X}_1$	$\overline{X}_2$	$\overline{X}_t$	Remark
1	Quality Electrical Poles were installed.	2.96	3.03	2.99	Agreed
2	Natural disasters such as erosion destroys installed facilities.	2.77	2.91	2.84	Agreed
3	Low quality of distribution line for the street.	3.04	3.08	3.07	Agreed
4	Poor installation of insulators to the electrical poles.	3.36	2.78	3.07	Agreed
5	Insufficient distribution of transformers.	3.04	2.81	2.93	Agreed
6	Poor maintenance against the usage of materials in generating light such as cables fuses etc.	3.23	2.86	3.05	Agreed
7	Good bracing of electrical poles after installation.	2.77	2.67	2.72	Agreed
8	Poor installation of fuses and other materials.	3.02	2.63	2.83	Agreed
9	Lack of constant maintenance of transformers.	2.93	3.11	3.02	Agreed
10	Low qualities of insulators materials.	2.77	3.22	2.99	Agreed

Key:

N_1 = Number of PHCN management staff

N_2 = Number of Consumers of Electricity

X_1 = Mean of PHCN management staff

X_2= Mean of Consumers of Electricity

X_t = Average Mean of PHCN management staff and the consumers of electricity

Table 1: Shows that the respondents agreed with all the items with mean score ranging between **2.72** to **3.07** respectively, as skills needed by PHCN management staffs and the consumers of electricity in Bosso Local Government of Minna Niger State.

Research Question 2:

What are the management challenges militating against effective distribution of electricity supply in Minna Metropolis of Niger State?

Table 4:

Mean Response of PHCN Management Staffs and the Consumers of Electricity on the Management Challenges Militating against Effective Distribution of Electricity Supply in Minna Niger State.

$N_1 = 70$ AND $N_2 = 180$

S/NO	ITEMS	X_1	X_2	X_t	Remark
1	Improper assessment of installed facilities.	3.41	1.62	2.52	Agreed
2	Poor management attitude of managing staff.	2.87	2.93	2.90	Agreed
3	Corruption amongst management staff.	3.18	2.44	3.81	Agreed
4	Too much incurement of dept.	3.12	3.05	3.08	Agreed
5	Lack of transparency among staff.	3.18	3.09	3.14	Agreed
6	Poor storage culture of electricity equipment.	3.07	2.91	2.99	Agreed
7	Lack of co-operation among management staff.	3.01	3.06	3.04	Agreed
8	Poor feedback policy from the general public.	2.83	2.71	2.77	Agreed
9	Improper handling of natural disasters.	3.04	3.04	3.04	Agreed
10	Poor provision of security for available facilities.	3.63	2.98	3.31	Agreed

Table 2: Shows that the respondents agreed with all the items with average mean score ranging between **2.52** to **3.31** respectively.

Research Question 3:

What are the strategies for improving distribution of electricity supply in Minna Metropolis of Niger State?

Table 5:

Mean Response of PHCN Management Staffs and the Consumers of Electricity on the Strategies for Improving Distribution of Electricity Supply in Minna Metropolis of Niger State.

$N_1 = 70$ AND $N_2 = 180$

S/NO	ITEMS	X_1	X_2	X_t	Remark
1	Orientation of the general public on proper management of equipments	3.30	3.03	3.16	Agreed
2	Regular maintenance of facilities.	3.26	3.19	3.23	Agreed
3	Provision of adequate security for electrical equipments.	3.24	2.44	2.84	Agreed
4	Adequate check on any form of corrupt practices.	3.14	3.19	3.16	Agreed
5	Settlement of all dept to appropriate quarters.	3.20	3.02	3.11	Agreed
6	Provision for natural disaster occurrence.	2.86	2.59	2.73	Agreed
7	Elimination of bureaucratic bottlenecks.	3.13	2.97	3.05	Agreed
8	Good feedback policy from the general public.	3.13	2.94	3.04	Agreed
9	Co-operation among PHCN staff.	3.00	2.94	3.97	Agreed
10	Employment of good and skilled labour.	3.22	3.08	3.15	Agreed

Table 3: Shows that the respondents agreed with all the items with the mean score ranging from **2.73** to **3.23** respectively.

HO_1:

There is no significant difference between the mean response of the PHCN management staffs and the consumers of electricity on the Infrastructural Challenges Militating against Effective Distribution of Electricity Supply in Minna Metropolis of Niger State.

Table 6:

t--test Analysis of PHCN Management Staffs and the Consumers of Electricity on the Infrastructural Challenges Militating against Effective Distribution of Electricity Supply in Minna Metropolis of Niger State.

$N_1 = 70$ $N_2 = 180$

S/N	ITEMS	X_1	SD_1	X_2	SD_2	t-test	Remark
1	Quality Electrical Poles were installed.	2.96	0.29	3.03	0.18	-0.94	NS
2	Natural disasters such as erosion destroys installed facilities.	2.77	0.26	2.91	0.18	-2.06	S
3	Low quality of distribution line for the street.	3.04	0.30	3.08	0.18	-0.14	NS
4	Poor installation of insulators to the electrical poles.	3.36	0.45	2.78	0.17	6.83	S
5	Insufficient distribution of transformers.	3.04	0.29	2.81	0.17	3.22	S
6	Poor maintenance against the usage of materials in generating light such as cables fuses etc.	3.23	0.32	2.86	0.17	5.00	S
7	Good bracing of electrical poles after installation.	2.77	0.27	2.67	0.17	1.47	NS
8	Poor installation of fuses and other materials.	3.02	0.28	2.63	0.17	5.57	S
9	Lack of constant maintenance of transformers.	2.93	0.28	3.11	0.19	-2.50	S
10	Low qualities of insulators materials.	2.77	0.27	3.22	0.19	6.43	S

Key:

N_1 = Number of PHCN management staff

N_2 = Number of Consumers of Electricity

SD_1 = Standard Deviation of PHCN management staff

SD_2 = Standard Deviation of Consumers of Electricity

t - cal = t – test analysis of respondents

X_1 = Mean of PHCN management staff

X_2 = Mean of Consumers of Electricity

S = Significant

NS = Not Significant

Table 4 revealed that the t – test analysis accept that null hypothesis of each items except 2, 4, 5, 6, 8, 9 and 10; are significant, meaning that there is no significant difference for all other items. According to PHCN management staffs and the consumers of electricity on the infrastructural challenges militating against effective distribution of electricity supply in Minna Metropolis of Niger State.

HO_2:

There is no significant difference between the mean response of PHCN management staffs and the consumers of electricity on the Management Challenges Militating against Effective Distribution of Electricity Supply in Minna Metropolis of Niger State.

Table 7:

t—test Analysis of PHCN Management Staffs and the Consumers of Electricity on the Management Challenges Militating against Effective Distribution of Electricity Supply in Minna Metropolis of Niger State.

$N_1 = 70$ AND $N_2 = 180$

S/N	ITEMS	X_1	SD_1	X_2	SD_2	t-test	Remark
1	Improper assessment of installed facilities.	3.41	0.35	1.62	0.22	22.9	S
2	Poor management attitude of managing staff.	2.87	0.28	2.93	0.18	-0.85	NS
3	Corruption amongst management staff.	3.18	0.32	2.44	0.17	10.0	S
4	Too much incurement of dept.	3.12	0.31	3.05	0.18	0.95	NS
5	Lack of transparency among staff.	3.18	0.32	3.09	0.19	1.20	NS
6	Poor storage culture of electricity equipment.	3.07	0.31	2.91	0.18	2.16	S
7	Lack of co-operation among management staff.	3.01	0.29	3.06	0.18	-0.69	NS
8	Poor feedback policy from the general public.	2.83	0.28	2.71	0.17	1.72	NS
9	Improper handling of natural disasters.	3.03	0.29	3.04	0.18	-0.14	NS
10	Poor provision of security for available facilities.	3.63	0.38	2.98	0.18	8.13	S

Table 5: Revealed that the t – test analysis accept that null hypothesis of each items except items 1, 3, 6, and 10 are significant, meaning that there is no significant difference for all other items. Accordion to PHCN management staffs and the consumers of electricity on the management challenges militating against effective distribution of electricity supply in Minna Metropolis of Niger State.

HO_3:

There is no significant difference between the mean response of the PHCN management staffs and the consumers of electricity on the Strategies for Improving Distribution of Electricity Supply in Minna Metropolis of Niger State.

Table 8:

t – test Analysis of PHCN Management Staff and the Consumers of Electricity on the Strategies for Improving Distribution of Electricity Supply in Minna Metropolis of Niger State.

N_1 = 70 AND N_2 = 180

S/N	ITEMS	X_1	SD_1	X_2	SD_2	t-test	Remark
1	Orientation of the general public on proper management of equipment.	3.30	0.33	3.03	0.18	3.60	S
2	Regular maintenance of facilities.	3.26	0.33	3.19	0.19	0.92	NS
3	Provision of adequate security for electrical. equipments.	3.24	0.33	2.44	0.17	10.7	S
4	Adequate check on any form of corrupt practices.	3.14	0.33	3.19	0.19	-0.66	NS
5	Settlement of all dept to appropriate quarters.	3.20	0.30	3.02	0.03	2.61	S
6	Provision for natural disaster occurrence.	2.86	0.32	2.59	0.17	3.81	S
7	Elimination of bureaucratic bottlenecks.	3.13	0.28	2.97	0.18	2.13	S
8	Good feedback policy from the general public.	3.13	0.30	2.94	0.03	2.18	S
9	Co-operation among PHCN staff.	3.00	0.29	2.94	0.03	0.91	NS
10	Employment of good and skilled labour.	3.22	0.11	3.08	0.18	0.11	NS

Table 6 revealed that the t – test analysis accept that null hypothesis of each items except items 1, 3, 5, 6, 7 and 8 are significant, meaning that there is no significant difference for all other items. According to PHCN management staffs and the consumers of electricity on the strategies for improving distribution of electricity supply in Minna Metropolis of Niger State.

SUMMARY OF THE FINDINGS

Based on the data collected and analyzed on Table 1 the following findings were made according to the research questions for the study.

Findings based on the Infrastructural Challenges Militating against Effective Distribution of Electricity Supply in Minna Metropolis of Niger State.

1. Quality Electrical Poles were installed.
2. Low quality of distribution line for the street.
3. Poor installation of insulators to the electrical poles.
4. Insufficient distribution of transformers.
5. Poor maintenance against the usage of materials in generating light such as cables fuses
6. Good bracing of electrical poles after installation.
7. Lack of constant maintenance of transformers.

Findings related to the Management Challenges Militating against Effective Distribution of Electricity Supply in Minna Metropolis of Niger State.

1. Lack of co-operation among management staff.
2. Poor feedback policy from the general public.
3. Improper handling of natural disasters.
4. Poor provision of security for available facilities.
5. Lack of transparency among staff.
6. Poor storage culture of electrical equipment.

7. Improper assessment of installed facilities.

8. Poor management attitude of managing staff.

Findings related to Strategies for Improving Distribution of Electricity Supply.

1. Provision of adequate security for electrical equipment.

2. Regular maintenance of facilities.

3. Elimination of bureaucratic bottlenecks.

4. Employment of good and skilled labour.

5. Co-operation among PHCN staff.

6. Provision for natural disaster occurrence.

DISCUSSION OF THE FINDINGS

The discussion of the findings of the study was based on the items revealed and put together according to the research questions and hypothesis that both respondents agreed that the following are some of the infrastructural challenges militating against effective distribution of electricity supply in Minna Metropolis of Niger State on table 1. The findings indicate that regular Power Supply is prime mover of technological and social development all over the world today. There is hardly any enterprise or indeed any aspect of human development that does not require energy. Nigeria as a country consistently suffers from energy shortage-a major impediment to industrial and technological growth. The Power Holding Company of Nigeria (PHCN) has the sole responsibility for managing the generating plants as well as distribution of nationally. The National Electricity and Regulatory Commission is assigned the responsibility to establish or approve appropriate operating codes and safety, security, reliability and quality standards and to monitor the operation of the electricity market (Owan,2005). The skill exchange in PHCN permits the staff to have the concept of basic principles of operation of distributing and transmitting and improve their skills in installed facilities. Also the staffs consume much time to carry out repair works. This was indicated by Adegbamigbe (2007), that development of human being through skill acquisition and environment dominated by technology was to save time, instead of manual activities. It was also indicated that the PHCN management staff need adequate training and retraining to maximize performance in repair works to satisfy their customers.

The finding also shows that the staffs have adequate knowledge and skills to determine faults in electrical installation. Hull (1991) has defined skill as the manual dexterity through the repetitive performance of an operator. Nandi (1998) indicated that knowledge and skill determine good repair works in any trade someone lays his/her hands on. He stressed, it further that it can be referred to adequately train the staff to improve in their vocations so that their services could be appreciated by the customers.

Good and conducive environment for the PHCN staff motivates or encourage the staff to concentrate on their desired works. Akinlabi (1992) stressed that, the facilities, workshops, tools, and materials contribute immensely to good working environment. If the environment is good and conducive, it is certain that the staff would get a desired course content of good working conditions.

The findings also indicate that when the total population using electricity is not captured and power is generated to only those that are captured, those not captured will ration it together with them: for all the consumers to have sufficient electricity supply, more substations should be built to boost the electricity to enhance effective distribution of electricity supply to all consumers at different rate because not all consumers require power at the same rate. Take for instance the industrial power supply at 415v and the domestic/residential power at 220v. in this ways and others, the distribution and transmission of electricity supply in Minna can be assessed (Theraja, 2007).

Findings from Table 2 of this study indicate that the major factor militating against the management of effective distribution of electricity supply: poor maintenance of equipment, our empirical study reveals that the generating units and their auxiliaries have become obsolete while poor maintenance culture of the organization has immensely contributed to the nagging erratic power failure in Nigeria. For instance, the Kainji Power Station commissioned in 1968 is yet to undergo a full turn around maintenance (TAM). The plant with an installed capacity of (760 MW) generates only (580 MW). Other power plants like Egbin (1320 MW) and Ijora with a combined capacity of 3153 MW also need routine repairs. The bureaucratic corruption, the corruption perpetrated by the staffs of the Authority who may connive with the customers in order to evade payment of PHCN bills endangers PHCN performance. The PHCN officials pretending to act for the organization collected money from customers for supply of prepaid meter yet they refused to supply the meters and thus damaging the tone and image of the organization.

The paradox of this huge indebtedness is that government parasitical and agencies are notorious with the highest unpaid bills. The total indebtedness which stood at N12, 477,442,811.00 is very disturbing. This indebtedness has also been identified (Obadan, 2000) when he said: "PHCN was crippled by its customers' indebtedness; its privatization can start with the employment of private companies to collect tariffs on its behalf". There is no reason doubting the fact that prompt payment of PHCN bills may likely enhance regular power supply and reduce PHCN"s ineptitude as earlier identified in this paper. This will enable it to fund the (TAM) Turn around maintenance of its machines as when due.

CHAPTRE FIVE

SUMMARY, CONCLUTION AND RECOMMENDATION

Summary of the Study

Electricity among other sources of energy is the most predominant due to the significant role it plays in the modern life system. Although, there cannot be a proper development in this modern world without electricity, because it holds the key prompting to industrial growth of any nation, either in service industries, or production industries that manufacture goods.

Domestically, most equipments and appliances used to make life easier for us such as air-conditioner, fans, fridges, television sets, phone etc are dependent on the electricity. It is difficult to point-out where electricity is not needed in one aspect or the other.

Therefore, this study is giving consideration to the long time perpetual power deficits in the country which arise from poor assessment of infrastructural, management of electricity distribution factors. The aim of this research work is to find out the Assessment of Factors Responsible for the Ineffective Distribution of Electricity Supply in Minna Metropolis of Niger State.

The related literature for the study was reviewed with some of the headings as;

1. Historical Background of Electricity Development in Nigeria.
2. Generation, Transmission, Distribution of Electricity in Nigeria.
3. Infrastructural Challenges Militating Against Effective Distribution of Electricity Supply.
4. Management Challenges Militating Against Effective Distribution of Electricity Supply.

5. Strategies for Improving Distribution of Electricity Supply in Minna Metropolis of Niger State.

A multistage survey research design method was used to develop the instrument of the study. The population for this study was the PHCN management staffs of 70 and non-management staff of 180 in Bosso Local Government of Minna Metropolis of Niger State. The instrument was analyzed using frequency count, mean score and standard deviation. The three research questions were fully answered. And the findings of this are highlighted based on the research questions.

Implication of the Study

The findings of this study obviously have certain implication on the Power Holding Company of Nigeria (PHCN) as the organisation that is responsible for the Effective Generation, Transmission, and Distribution of Electricity Supply since it is the major or sole power producing company in Nigeria.

The findings of this study with regard to the approval of special technical staff salary scale and in-service training as motivation also have implication as this would enable staff to gain more practical knowledge from the special technical staff and equally increased the level of learning and understanding to perform effectively in Transmission, Distribution of Electricity Supply in Minna Metropolis of Niger State.

The findings of this study with regard to information and communication technology (ICT) facilities has its own implication, as the main purpose of (ICT) is to improve the quality of distribution, transmission and monitoring the process of generating power supply.

The implication on the Power Holding Company of Nigeria is that if effective measures are not taken to correct the Factors Responsible for the Ineffective Distribution of Electricity Supply, there will be no economic and social development because industries will not function effectively.

Conclusion

From the finding of this research work, it has made effort to establish the position that Assessment of Factors Responsible for the Ineffective Distribution of Electricity Supply in Minna Metropolis of Niger State has been carried out in order to increase in power generation, transmission, distribution in the metropolis for effective use and reliability maximally.

Recommendation

1. Training of PHCN staffs on the use of geographic information system (GIS).
2. The whole of the country should be mapped for effective management of PHCN facilities.
3. There is also need for training and retraining of technical personnel in PHCN to learn the new technologies and maintenance of the existing equipment.
4. Increase revenue generation as more customers will be captured.
5. Construction of more substations to boost electricity supply.
6. Replacement of old distribution equipments and facilities including constant servicing.
7. There should be adequate funding provided to the power sector in order to carryout maintenance work effectively when due to avoid the total collapse of the system.

8. Establishment of a GIS department in all the zone and district offices of PHCN throughout the country and a surveyors / GIS expert as the head of the department.

Suggestions for further research

Based on the finding of the study, the following suggestions were made for the study:

1. Assessing the Present State of Electricity Supply through Deregulation towards Achieving on Uninterrupted Power Supply in Minna Metropolis of Niger State.

2. The Impact of Industries in the Electricity Distribution Network Service Providers Service Target Performance Incentive Schemes in Minna Metropolis of Niger State.

References

Ajanaku, l. (2007). Battling with Darkness. TELL (Special Edition), May 21, 2007 pp. 31-33.

Akinlabi, (1991). Effective Facilities Planning, Management, Maintenance and Tools for Achieving Functional Technology Education Curriculum. A Paper Presented on Seminar Organized by the Technical Education Department held at Adeniran Ogunsanya College of Education, Lagos 20 – 22 June.

Akpan, I. (2005). Deregulating the Nigeria Power Sector. The Case of Privatization South-South Journal of Culture and Development, 7(1): 87- 108.

Arolowo, A. (2006). PHCN's Official Extortion. The Punch, March 13, 2006 p.16.

Asia Pacific Energy Research Center (2000). Electricity Sector Deregulation. Retrieved from: www.aer.gov.au

Atser, G. (2007)a. Power Projects: Stakeholders fret over gas cuts. The Punch, March 22, 2007.

Atser, G. (2007)b. Chinese firm set for Mambilla. The Punch, April 4, 2007 p.63.

Caven, B. (1992). Electricity in Nigeria: A brief history on NEPA proceeding of first National Conference of NSE (Elect. Dept) 21 march, 1992.

Hull, H. S. (1971). Methods and problems in Apprenticeship System. New-York. The Century Publishers Company.

Johnston, D. (2003). Replacement of Lost Asset Valuation and the Regulation of Energy

Infrastructure Tariffs. Theory and Practice in Australia Centre for the Study of Regulated Industries. International Series 8.

Johnson, B. (2007). Odds against Yar'Adua. The News, May 21, 2007 pp.18-23.

Kirkpatrick CH, LeeN, Nixon, E. I. (1985). Industrial Structure and Policy in Less Developed Countries, Hert: George Allen and Unwin.

Manafa, N. (1995). Electrical Development Journal in Southern Africa 18 (3) 23-24. Niger Power Review (1989). The Nigerian Supply Electricity Industry. Electricity Development in Nigeria Ibadan. Oxford University press. 10-15.

Nwachukwu, c. (2007). Vandalisation, gas shortages cause low power supply. The punch, may 30, 2007 p.28.

Obadan, M.I. (2000). Privatization of Public Enterprises in Nigeria. National Centre for Economic Management and Administration, Ibadan, pp. 4.

Odiaka, P. (2006). Power Sector Reforms: still a reign of blackout. The guardian, august 24, 2006 p. 15.

Ogumodede, O. B. (2005). Consumers Expectations on Service delivery of PHCN: A Study 1 in Lagos and Ibadan Metropolis. MBA Thesis (Unpublished), Owerri: Imo State University.

Ogungimi, A. (2007). Succumbing to Imports. TELL May 21, 2007 pp. 40- 41.

Okoro, O. I. and Madueme, T C.(2004). Solar Energy Investments in a Developing Economy Renewable Energy. Journal of Southern Africa. 2a, 1599-1610.vol. 29, 2004.

Okoro, D. I. and Madueme, T C: "Solar Energy: A Necessary Investments in a Developing Economy", International Journal of Sustainable Energy, vol. 25, no.2006,pp. 23-31.

Olowu, B. (1983). Development Administration in Africa: A Critical Appraisal of Administrative Reforms in Nigeria, "African Administrative Studies. 23: 89-104.

Omoleke ii, (2000). Energy Crisis and Nigeria Economy: a Contemporary Analysis. Afr. J. Bus. Econ. Res., 12.

Omoleke ii, (2008). "Emergence and Collapse of Public Enterprises in Nigeria", Ile-Ife, OAU Press.

Owan, R. (2005). The Nigeria Power Industry – The Next Goldmine. A Lecture delivered at the Nigeria – British Chamber of Commerce in Lagos, Nigeria, October 13, 2005.

Rajput, R .k. (2006). A Textbook of Power Plant Engineering in S.I Unit for B.E; B. Tech; U.P.S.C. (Engg. Services); Section B.A.M.I.E. (India).

Shehu, b. A. (2008). Strategies for Improving Power Supply in Federal Capital Territory (FCT) Abuja. Federal University of Technology, Minna.

Theraja, B. L and Theraja, A. K. (2007). A Textbook of electrical technology in S.I system of Units: Rajendra Ravindra Printers, India.

Sani, M. (2010). Lecture note on Energy and Power. Federal University of Technology, Minna, ITE Department.