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Installation of single and three phase pole mounted meters with U.I.U.

Princewill Abia

CERTIFICATION

I, Engr. ..... a COREN/Corporate Member of the Nigeria Society of Engineers (NSE) do hereby certify that Mr. Abia Princewill has worked under my supervision for some years and I have no doubt that he has acquired adequate experience in the practice of the engineering profession.

NSE Reg No .....

COREN Reg No .....

Designation.....

Date.....

DEDICATION

This work is dedicated to GOD almighty for His divine guidance and wisdom throughout the project work and also to my parents for their encouragement and the belief that they had in me.

ACKNOWLEDGEMENT

My sincere appreciation goes to Engr. Anajemba, Chibuzor, the secretary of NSE Auchi branch for his unwavering support during the entire process of the NSE enrollment and preparation.

My unreserved appreciation also goes to Engr. Meshaic Okhumeode, who has mentored me and given me the opportunity to prove myself while working under him.

I will not fail to acknowledge Engr. F.E.O Okhaise who without hesitation signed the necessary documents for me during my application.

Finally, I recognize with undying gratitude, the love, support and encouragement of my fiancée Miss Glory Osadume who gave me the push I needed to embark on this.

Abia, Princewill

1.0 INTRODUCTION

This report presented herewith gives an overview of the professional experiences I have garnered since graduation from school.

I graduated from university of Uyo, Uyo in the year 2012 with a Bachelor of Engineering honours in Mechanical Engineering Department. My experience in the field of engineering started with an industrial training while in school. I embarked on a six months industrial training at AK-RUWATSAN, an Akwa-Ibom state owned agency responsible for drilling, well design/construction and management of water supply for rural communities. After graduation, I was deployed to Delta state for the compulsory National Youth Service Corps program. On completion of the three (3) weeks orientation service in camp, I was posted to Kpakiama Senior Secondary School, Bomadi L.G.A where I handled mathematics in both JSS 3 & SSS 3. However, in January 2013 I was employed as a technical officer by RONESANS NIGERIA LIMITED and I worked with the mechanical section. In December 2014, I was employed by Vigeo Power Limited but deployed to their subsidiary company, Benin Electricity Distribution Company (BEDC) where I worked as a metering officer till date.

1.1 PURPOSE OF THE STUDY

This project report is presented in partial fulfillment of the condition required for the admission into the corporate membership of the Nigeria Society of Engineers (NSE). It gives a detailed account of the post graduate experience I have garnered while working for RONESANS NIGERIA LIMITED as well as BEDC. It brings into focus, the various challenges I encountered and the solutions proffered to surmount the challenges.

CHAPTER TWO

POST GRADUATE TRAINING AND EXPERIENCE

2.0 PROJECT 1: INSTALLATION OF FIRE FIGHTING DEVICE & SPRINKLERS AT SHERATON HOTEL, IKOT-EKPENE.

2.1 INTRODUCTION.

I joined RONESANS NIGERIA LIMITED in January 2013 as a Technical officer and I was posted to the mechanical section of the company. While in this section, I had the opportunity of working with the foreign personnel from Turkey in the design and fabrication of air conditioner ducts for the central air conditioning system and also took part in the installation of sprinklers and pipes to channel water to the sprinklers. Each of the rooms was fitted with smoke sensors that would activate the sprinklers in the event of a fire outbreak.

2.1.1 YEAR OF PROJECT: 2013

2.1.2 ROLES OF CANDIDATE DURING PROJECT EXECUTION

As a technical officer, I was saddled with the following responsibilities during the project:

- Interpretation of the design and mechanical drawings
- Designing/fabrication of the pipe threads
- Supervision of the measurement and cutting of the pipes
- Supervision of the threading and fixing of the pipes to ensure accuracy
- Testing and commissioning of the installed devices

2.1.3 CLIENT NAME:

Sheraton Hotels

2.1.4 EMPLOYER:

Ronesans Nigeria Ltd

2.1.5 SUPERVISING SUPERIOR:

Engr. Ismail Ibrahim (H.O.D Mechanical Section)

2.1.6 COST OF PROJECT:

One million, Seven Hundred and Sixty Eight Thousand Naira (N1,768,000.00).

2.1.7 NEED AND PURPOSE FOR PROJECT

The purpose of the project was to ensure a safe and conducive environment in the event where there is a fire outbreak or any accident resulting in smoke emission which could cause suffocation.

2.18 STEPS TAKEN IN EXECUTING THE PROJECT

Here are some of the steps taken for the execution of this project:

- Interpretation of the mechanical drawing from the architectural section.
- Measurement, marking and cutting of the 1½ inches pipes used.
- Threading of the pipes/fixing of sockets and elbows where necessary.
- Fixing of the pipes in the ceiling of the building and fixing of sprinklers.
- Testing of the entire set up.

2.1.9 CHALLENGES ENCOUNTERED AND SOLUTION PROFFERED

The challenges encountered during the execution of this project

were as follows:

- Since my supervisor was a foreign national who couldn't understand English Language, there was difficulty communicating and explaining challenges faced during the work to him, however in overcoming this, we used a translator app called Yandex to effectively communicate.
- The second challenge was supervising people that were older than myself and whose level of education were below mine. I was able to maintain a cordial working relationship with all of them by relating with them at their level and also according them respect when it mattered. With these, they in turn respected me and carried out whatever assignment I gave them.

2.1.10 EXPERIENCE GAINED

On successful completion of this project, I was able to develop and improve on my skills of human management since my role basically involved supervision of skilled, semi-skilled, educated and not so educated individuals. In addition, my knowledge of engineering principles was also broaden because the entire project involved different branches of the engineering profession.

2.2 PROJECT 2: INSTALLATION OF MD METERS AT NIGERIAN AIR FORCE BASE, BENIN CITY.

2.1.1 INTRODUCTION:

A careful study revealed that so much energy was being drawn by the military and its facilities and there was need to measure what was being consumed by them, in order to balance the losses being reported by the G.R.A Business Unit at every monthly progressive Review meetings. It was difficult collecting revenue from the Airforce base through a house to house cash drive, therefore we decided to install a Maximum Demand (MD)

Meter at the transformer point and whatever readings recorded at the end of the month was sent to their office in Abuja and the bill was always recovered in full and with ease.

2.2.2 YEAR OF PROJECT: 2016

2.2.3 ROLES OF CANDIDATE DURING PROJECT EXECUTION

The following were roles I played during this project:

- Programming of the meter to suit the CT rating.
- Identifying the right rating of current transformers to be used.
- Signing/taking outage to ensure safety of men and materials on the field.
- Supervising the mounting and installation of the meter.
- Connection of the meter to the test terminal block and the CTs to the test terminal block.
- Testing, commissioning and certification of the installed meter.

2.2.4 CLIENT NAME

Nigerian Air force

2.2.5 EMPLOYER OF CANDIDATE

Benin Electricity Distribution Company (BEDC)

2.2.6 SUPERVISING SUPERIOR

Engr. Prosper Ovuomerie

2.2.7 COST OF PROJECT

Three Hundred and Fifty Thousand Naira (N350,000)

2.2.8 NEED AND PURPOSE FOR PROJECT

As a result of the losses reported by the G.R.A Business Unit of BEDC. It was very important to go all out and capture every aspect where there were suspected losses, therefore during a thorough analysis, it was discovered that the major losses in revenue and energy experienced by the Business Unit was due to the three transformers installed at the Airforce base. In solving this problem, meters were installed to measure the energy consumed by the Nigeria Airforce base and subsequently recover all revenue lost to them.

2.2.9 STEPS TAKEN IN EXECUTION OF THE PROJECT

Listed below are they steps I took in the execution of this project:

1. Site visit to determine the best position or location where the meter could be installed.
2. Determining the right rating of the meter and CT to accommodate the transformer rating.
3. Programming the meters to the appropriate ratings.
4. Mounting the meters and the CTs.
5. Ensuring that the armour cables are correctly passed through the CTs.
6. Ensuring that the polarity of the CTs are properly arranged to capture the correct reading.
7. Commission of the meter.

2.2.10 CHALLENGES ENCOUNTERED AND SOLUTION PROFFERED

The major challenge faced during this project was exhuming of the armour cable because the cable was not on the surface as was the case in other substations I have worked with. However, we were able to dig out the cable and use it for the installation.

2.2.11 EXPERIENCE GAINED

The project helped me in understanding the use of instrument transformer (current transformer) and their practical application in metering, I was able to understand first hand, the effect and losses that could be incurred if the polarity of the CTs were not accurately arranged.

2.2.12 REMARK/RECOMMENDATION

Routine checks must be carried out on the meters to ensure that they were not tampered with and its purpose for installation was achieved.

2.3 PROJECT 3: INSTALLATION OF INTERBOUNDARY METER AT VARIOUS POINTS BETWEEN DIFFERENT BUSINESSES

2.3.1 INTRODUCTION

While working as an industrial metering personnel, I had the privilege of working with the team who metered 33KV feeders for different Business Unit (BU) in Benin metropolis, these places include;

- Etete/Sokponba Business Units by Transmission Company of Nigeria (TCN) Benin
- Ugbowo/Okada Business Units at Igwoshodi Community
- Ugbowo/Evbuotubu Business Units at Evbuotubu injection substation by Ogheghe junction
- Evbuoriaria (Now Etete)/Sapele Business Units at Ologbo
- Ugbowo/Okada Business Units by Precious Palm Royal hotel along Benin Lagos Road.

2.3.2 YEAR OF PROJECT

2015-2016

2.3.3 ROLES OF CANDIDATE DURING PROJECT EXECUTION

The following were my roles during the project:

1. Brainstorming on the best design for the gantry.
2. Supervision and monitoring of casting of the plinth.
3. Supervision of erecting of gantry.
4. CT/PT mounting monitoring.
5. Connection of CT/PT to the meter and the 33KV feeder.
6. Commission and certification of the project.

2.3.4 CLIENT NAME

Benin Electricity Distribution Company (BEDC)

2.3.5 NAME OF EMPLOYER

Benin Electricity Distribution Company (BEDC)

2.3.6 SUPERVISING SUPERIOR

Engr. Meshaic E. Okhumeode

2.3.7 COST OF PROJECT

Three million, Seven Hundred and Forty Eight Thousand, Two hundred and Twelve Naira (N3,748,212.00)

2.3.8 REASON AND PURPOSE OF THE PROJECT

A closer look at the generation and transmission allocation shows that only 9% of whatever is generated is wheeled to Benin Electricity Distribution Company. As a result of the increasing demand for energy by the populace and taking into cognizance the Aggregate Technical Commercial and Collection (ATC & C) losses, it was necessary that BEDC know the actual amount of energy used by the various Business Units in order to improve her billing efficiency. This project also assisted in tackling the issue of arguments arising from the amount of energy consumed by the various Business Units.

2.3.9 STEPS TAKEN IN EXECUTING THE PROJECT

The following steps were taken in ensuring the success of the project;

a. Site tour to determine the boundaries between the Business Unit.
b. Line load analysis to determine appropriate CT/PT ratio.
c. Construction of gantry for mounting of current and potential transformers.
d. Casting of plinth, mounting of gantry, installation of current transformer as well as the meter.
e. Testing, commissioning and sealing.

2.3.10 ISSUES ENCOUNTERED AND POSSIBLE SOLUTIONS

The major challenges encountered were;

- Inability in identifying the exact boundary between two Business Units. In solving this issue, the Business Head Distribution of the Business Units involved were brought to the field to identify their boundaries appropriately.
- Another challenge faced was how to prevent the anchor/hook on which the gantry was to sit from shifting when the concrete sets. In solving this, a wooden frame was designed and used in holding the anchor rods firmly in position till the concrete set and then it was removed.
- Yet another challenge was how to install the equipment in a safe location within the assigned boundary to prevent vandalism.
- To resolve this issue, we ensured that before work was done, the community leaders and the youths were well informed and advised to form a sort of community police or vigilante for the safety of the project.

2.3.11 EXPERIENCE GAINED

By taking part in this project, I further broaden my knowledge of instrument transformers. I also understood the need for a proper study and analysis of any project before embarking on them.

2.4 PROJECTS 4: INSTALLATION OF SINGLE AND THREE PHASE POLE MOUNTED PREPARED METERS WITH U.I.U FOR OBA PALACE FEEDER

2.4.1 YEAR OF PROJECT: 2017

2.4.2 ROLES OF CANDIDATE DURING PROJECT EXECUTION

During the project, the roles I played include:

- Site visitation and enumeration of customers to be metered.
- Load measurement and analysis to determine customer's consumption.
- Determining the type of meter to be assigned to customers based on the load analysis carried out.
- Design and fabrication of the meter box.
- Testing and wiring of the meter in the newly fabricated meter box.
- Supervision of the installation of the meters.
- Commissioning and sealing of the installed meters.
- Documentation and report writing.

2.4.3 CLIENT NAME

Benin Electricity Distribution Company (BEDC)

2.4.4 EMPLOYER OF CANDIDATE

Benin Electricity Distribution Company (BEDC)

2.4.5 SUPERVISING SUPERIOR

2.4.6 COST OF PROJECT

Three million and Twenty Eight Thousand Naira (N3,028,000.00)

2.4.7 REASON FOR PROJECT EXECUTION

Exactly two (2) years, after privatization, Benin Electricity Distribution Company (BEDC) realized that her set ATC & C loss target of 30% could not be achieved. This was as a result of the various fraudulent and nefarious activities of customers on the prepaid meters. Customers were involved in various power thefts and this in turn resulted in a decline in the revenue recovered by the company.

Therefore there was need to curb this practices and this informed the decision to meter customers on the pole and at the source of supply.

2.4.8 STEPS TAKEN IN THE EXECUTION OF THE PROJECT

In order to effectively execute this project, the following steps were taken;

1. Site visit/enumeration to determine the population of customers to be metered.
2. Load measurement and analysis to determine the energy demand of each individual customer as well as the combined energy demand of the area to be metered.
3. Rolling out of single and three phase meters according to the load analysis earlier carried out.
4. Design, fabrication and wiring of the meters in the meter box with indicators and anti-theft devices.
5. Installation of the meters.
6. Commissioning and sealing of the installed meters.

2.5.9 CHALLENGES FACED AND SOLUTIONS PROFFERED WHILE EXECUTING THE PROJECT

While working on the project, some challenges were encountered and technically resolved. Some of the challenges were;

a. The project happened during the rainy season and as a result some of the meters failed due to moisture also there were short circuits in some of them as a result of the moisture bridging the contacts inside. In resolving this, the box was redesigned to ensure that it was moisture proof and all installations were thoroughly supervised to ensure that they met the required metering standard.

b. There was yet another issue of resistance and rejection of the pole mounted meters by customers. They rather preferred the meters be installed at their premises where they could have access to. Because of the history of power theft in the vicinity, we tried educating the customers on the benefit and advantages of installing the meter on the pole. We explained to them that there would be given a User Interphase Unit (UIU) which was like a remote from where they could monitor their consumption and as well as recharge their meters therefore they had no business with the meter that was mounted on the pole.

2.5.10 EXPERIENCE GAINED

As part of the knowledge gained in the course of executing this project, I was able to appreciate the importance of a proper load/energy demand analysis. Failure to do a thorough load demand analysis could result in the failure of any electrical equipment. I also learnt that it was imperative to have

protection devices for the meters like circuit breakers since the use of cut out fuse was eliminated.

VOLUME 2

CHAPTER ONE

1.1 INTRODUCTION

Nigeria as a nation of over 180 million citizens is saddled with the responsibility of providing energy of over 120,000 MW to adequately meet the increasing demand of her populace. However, due to the aging infrastructures of the transmission company and the low installed capacity of the generation stations, she is only able to generate and wheel between 3000-5000 MW.

The distribution companied now pick whatever allocation is given to them and supply to the final consumers but the reality remains that most of these energy supplied by the distribution companies are lost to theft by way of infractions, and meter bypass which invariably results in a loss of revenue to the company. The need to curb these losses which are humanly induced informed the design and execution of the project.

1.2 TERMS ASSOCIATED WITH ELECTRICITY AND THE PROJECT

1.2.1 CURRENT

Electric current I, is the flow of electric charge which are carried by moving electrons. Its unit is Ampere, A. It has two components namely;

- Direct current DC. This is the unidirectional flow of electric charges. Its sources include batteries, solar cells, thermocouples etc.
- Alternating current AC. This is the flow of current in which the flow of electric charge periodically reverses direction.

Mathematically, the current is given as

$I \propto R$ ----------1.0a

$V = IR$ ----------1.0b

$I = V/R$ ---------- 1.0c

1.2.2.1 POWER

This is the rate, per unit time at which electrical energy is transformed or consumed by an electric circuit. The unit of power is the Watt (W).

Mathematically, it is given as;

$P = IV$----------1.2

But remember $I = \frac{V}{R}$ from equation 1.0c

Therefore, $P = V\left(\frac{V}{R}\right) = \frac{V^2}{R}$ ----------1.3

1.2.2.1 ELECTRIC CIRCUIT

An electric circuit is a conducting path, which allows charge to flow from one terminal to the other. A simple circuit might consist of a single strand of metal wire linking the positive and negative terminals.

1.3 ENERGY METERS

An energy meter is a device that measures the amount of electric energy consumed by an electrically connected device. In Nigeria and the world over, energy meters are installed at customer's premises by the utility companies for measurement and billing purposes. They are calibrated in kilowatt per hour (kWh).

1.4 TYPES OF ENERGY METERS

There are various categories of energy meters and these include;

a. Electromechanical meters
b. Electronic meters
c. Smart meters
d. Prepaid meters

1.4.1 ELECTROMECHANICAL METERS

This is the kind of meter that was prevalent during the era of NEPA. This meter operates by counting the revolutions of a non magnetic, but electrically conductive, metal disc which is made to rotate at a speed proportional to the power passing the meter. The accuracy of these meters drop or depreciate with age.

1.4.2 ELECTRONIC METERS

These meters operate on the basis of Digital Micro Technology (DMT) and they use no moving parts.

They are controlled by a specially designed IC called Application Specified Integrated Circuit (ASIC). In addition to measuring energy consumption, they can also record other parameters of the load and supply such as maximum demand, power factor, reactive power used, date etc.

1.4.3 SMART METERS

These are meters that have been invented to solve some challenges faced from the use of electromechanical as well as electronic meters. It could record consumption of energy at intervals and automatically communicate that information at least daily back to a central server for monitoring and billing. These meters can carry out self-diagnostics test and enable two-way communication between the meter and the server of a utility company using

the Advance Metering Infrastructure. Unlike the electromechanical meters that only measure total consumption with no information of when the energy was consumed, the smart meters offer the possibility of retrieving this information, thus allowing utilities to introduce different prices for consumption based on the time of day and the season.

1.4.4 PREPAID METERS

These are special energy meters that requires customers to make advance payment for energy before using it and cut off the supply by a relay when the available credit is exhausted. This kind of meter is able to perform more functions than the smart meters; they help customers control their energy usage more easily. These meters are employed by utilities if they believe that the customer may not pay the bill and to also reduce the number of visits to the customer's premise. This is done via a token/key generation that is entered into the meters.

However, there are basically three types of prepaid meters and this include;

- **Single phase prepaid meters:** It gives the consumers access to a single phase of the supply line without cut-out fuses i.e two cables entering the meter live and neutral and two cables leaving the meter for supply to the customer. The maximum rated capacity of the load in a single phase meter is 60A.
- **Three Phase Meters:** It gives the customer access to the three phases of supply line and with cut-out fuses depending on the type of wiring of the house. The maximum load capacity of the 3Q meter is from 60A to 100A.
- **CT Operated Meters:** These are non-whole current meters, but are CT operated to step down the voltage entering the meter. They are

used mainly for maximum demand (MD) customers connected to 11KV or 33KV supply with load level of 100A and above.

1.6 METER INFRACTION

Energy meters can be manipulated, thus causing them to stop, under-register or even go blank. Customers tamper with these meters to fool the utility companies and thus use light without paying for it. Meter infractions, load diversion has been recognized as a very serious issue for the utility companies, thus the essence of this project work to eliminate customers reach to the meter as much as possible.

CHAPTER TWO

DESIGN FUNDAMENTAL

2.0 PROJECT ASSESSMENT

The effect of energy theft cannot be overemphasized especially with the fact that the allocation given to BEDC from the national grid is not even sufficient for the entire population of the four state she covers. For this reason, there was need to checkmate this menace in other to ensure that whatever energy lost was only due to technical losses which the utility presently has little control over. On successful execution of this project it was observed that the collection in the area where the project was executed greatly improved.

2.1 SITE VISITATION AND ENUMERATION OF CUSTOMER

A visit to the field was conducted to ascertain the viability of the network to support the project, any wooden pole, fallen poles or places that required

additional poles were noted. This was closely followed up with the overall head count of the customers connected to the specialist transformer and CBN 2 transformers. As part of the enumeration, some information of the customers were obtained for documentation, the information included, the name of the Business Unit, Service Unit, Transformer, Customer's name, correct address, old meter number (if any), account number, tariff class and phone numbers. The enumeration helps in the tagging of meters to ensure that the correct meter is tag to the right customer and also eliminate any incident of meter swapping at the point of installation.

2.2 LOAD MEASUREMENT/ANALYSIS

In other for the meters not to fail after installation, it was necessary to carry out load assessment of every individual customer that were to be metered. This was done using the clamp-on Ammeter. The total load analysis was essential in other to determine the anticipated demand on the transformer and the network components. Where there was no supply, the billing calculator (Appendix I) was used to accurately estimate the load of the customer.

Please refer to APPENDIX for the data.

2.3 DESIGN SPECIFICATION

As a result of the climatic condition of Nigeria, using the manufacturer's box was prone to moisture therefore there was need for a better design to take care of this constraint.

2.3.1 METER BOX

The meter box measuring 350mm x 400mm was designed in such a way that it could accommodate up to eight meters of customers connected on a single pole. A bus bar was fitted inside for the distribution of the supply. There was also a neutral bar inside to separate the neutral connections and keep the wiring within the box neat. Protection of the meter from surge was essential therefore we connected a 60Amps circuit breaker on the load side of the connection to forestall any incident of surge arising from any illegal activities from the customers end. There were indicator lights connected to all the meters within the box to show the different phases each customer was connected to. To prevent further tamper by unauthorized personnel, we energized the key of the box by connecting a live wire to it. The box could therefore only be accessed by a trained metering officer.

Picture 1

Picture 2

Wiring of Meters in the newly designed meter box

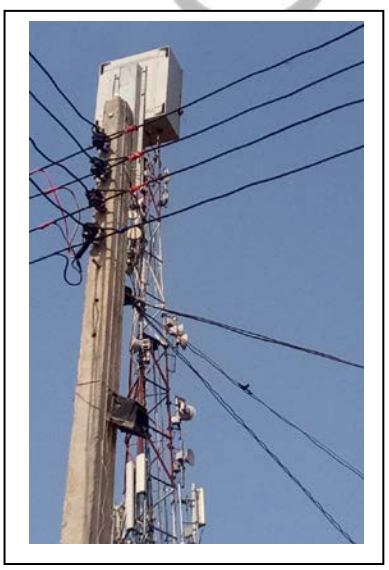
2.3.2 FABRICATION OF THE CHANNEL IRON

A channel iron measuring 850mm in length was also used in the installation. The channel iron was drilled and then attached to the pole using a 5/8" bolt and nut. The meter box was also attached to the channel iron using a 2½" bolt and nut with washers.

2.3.3 INSTALLATION:

First of all, for safety of the workforce, the transformer is defused or outage is taken as the case may be. The line is teased to be sure it is dead before we commence work.

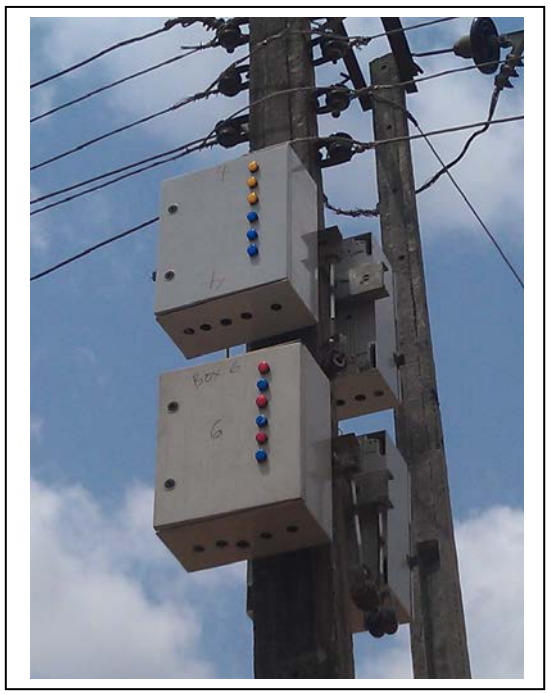
The meters are connected in the box depending on the number of customers to be fed from one pole. The box is carried up the pole by a lines man where it is mounted on the channel iron. An armour cable is used to power the meter from the 415 volts line and connected to a switched where the meter connections are also tied to. On successful connection, power is restored and the meters are commissioned before the box was sealed.



Picture 3

Picture 4

Installation of the pole mounted meters and a lines man doing the installation.



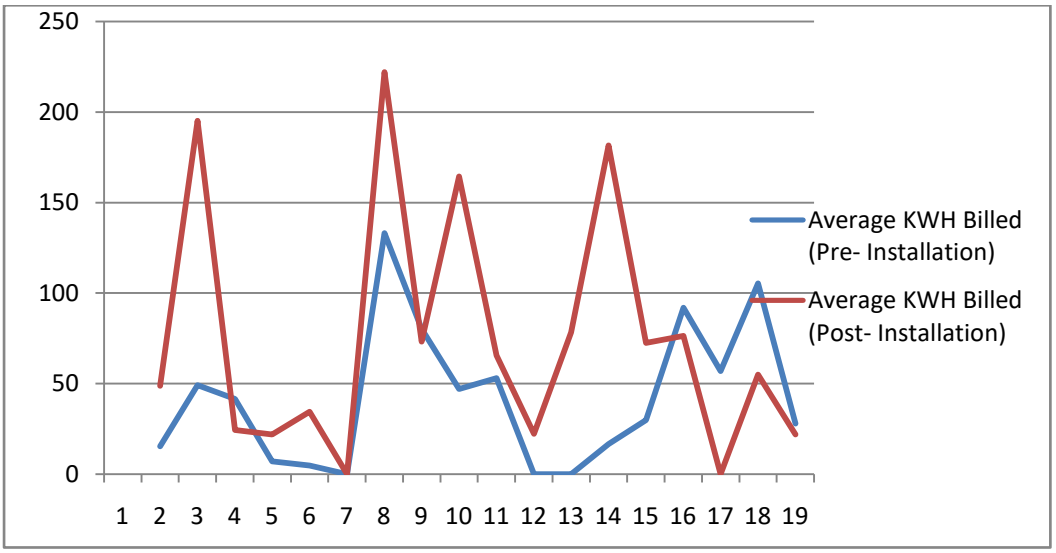
Picture 5

Picture 6

Setup of the box on the pole awaiting connection to the 415V line

2.4 POST INSTALLATION ANALYSIS

The essence of the project was basically to reduce the ATC & C losses from 54% to 30% or even less and also increase the overall revenue recorded by the company. Below is a table and graph that shows the effect of the project.



From the table, we observed that after a successful execution of the projection, the average vending of nearly all the customers increased in less than six (6) months than it did in eleven months of pre-installation.

The logical interpretation of this is that so much energy was lost to theft, bypass and tempering, however with this project, this issue has been adequately addressed. Of course, if the vending rate increases, it is only normal that the amount of revenue from these customers will invariably increase as well, this can be seen both in the table and from the graph.

CHAPTER 3

3.0 PROJECT COSTING

Whatever project conceived, there is need to analyze the cost of materials to be used and the labour for the job. For this project, the cost estimate is summarized below;

3.1 BILL OF ENGINEERING MEASUREMENT AND EVALUATION

Table 3.0: Bill of Engineering Measurement and Evaluation

S/N	DESCRIPTION OF ITEM	QTY	UNIT PRICE	TOTAL COST (N)
1	Concrete Electric Pole	7	40,000	280,000
2	Shackle	20	1,000	20,000
3	D-Iron	20	800	16,000
4	Channel Iron	2m	50,000	50,000
5	5/8” bolt and nut	28	1,500	42,000

6	5/8" Washers	56	100	5,600
7	Conlog Single phase (IQ) meter	16	40,000	640,000
8	Conlog Three phase (3Q) meters	3	69,000	207,000
9	Circuit breaker (60A)	22	700	15,400
10	Insulation Tape	20	100	2,000
11	Metal Rail	1m	2,500	2,500
12	Copper Bar	½ m	5,000	5,000
13	70mm^2 Armour cable (four core)	15m	12,000	180,000
14	Line Tap	12	400	4,800
15	Cable tie	3 packet	800	2,400
16	Drilling machine	1	45,000	45,000
17	Copper cable 10mm^2	5m	2,000	10,000
18	Indicator bulb	19	250	4,750
19	Meter box	6	6,000	36,000
20	16mm^2 aluminium cable	1 coil	12,00	12,000
	SUB-TOTAL			**1,580,450**
	10% Contingency			**158,045**
	TOTAL			**1,738,495**

3.2. DIRECT LABOUR COST

Table 3.1

S/N	STAFF	MEN	DAY	UNIT /DAY	TOTAL COST (N)
1	Service Manager	1	3	3,500	10,500
2	Metering Engineer	2	5	3,500	35,000

3	Lines men (Technicians)	4	5	1,500	30,000
	SUB TOTAL				**75,500**
	10% Contingency				**7,550**
	TOTAL				**83,050**

3.3 TRANSPORTATION COST

Table 3.2: Transportation Cost

TYPES OF VEHICLE	NO OF DAYS	AMOUNT /DAY	TOTAL COST (N)
Pick up Van	5	25Hrs @ 145/L	18,125
High Crane for planting pole	2	15,000	30,000
SUB TOTAL			**48,125**
10% Contingency			**4,812.5**
TOTAL			**52,937**

3.4 CIVIL AND MECHANICAL WORK

Table 3.3

DESCRIPTION	UNIT COST (N)	AMOUNT (N)
Digging of earth for pole (12ft) and ramming	6,000	6,000
Cutting, filing and drilling of holes in channel iron	8000	8,000

SUB-TOTAL		**14,000**
10% Contingency		**1,400**
TOTAL		**15,400**

SUMMARY OF PROJECT COST

Material Cost 1,738,495

Direct Labour Cost 83,050

Transportation 52,937

Civil & Mechanical Cost ... 15,400

GRAND TOTAL **1,889,88**

CHAPTER FOUR

4.0 CONCLUSION

After a successful execution of the project, it was certified and officially commissioned by the acting Head of Meeting in BEDC Engr. Meshaic E. Okhumeode. Since installation till date, the revenue in this area has improved and the incessant energy theft has been curtailed. In a nut shell, this is one of the projects I have spent maximum time with from start to finish. I believe with this work, my application for registration into the Nigeria Society of Engineers would be considered. This will position me and also help me in contributing more to the development of the Engineering practice in Nigeria.

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