Global Scientific JOURNALS

GSJ: Volume 8, Issue 7, July 2020, Online: ISSN 2320-9186
www.globalscientificjournal.com

THE WORK DESCRIPTION OF THE MAINTENANCE OF PASSIVE AND ACTIVE EQUIPMENT IN BASE TRANSCEIVER STATIONS WITHIN A PARTICULAR CLUSTER

OKOLO C. C[1], EZEUGBOR I. C[2], CHIME T. N[1], OMEJE B. E[1]

[1]ELECTRONICS DEVELOPMENT INSTITUTE, FEDERAL MIN. OF SCIENCE AND TECHNOLOGY, AWKA CAPITAL TERRITORY, ANAMBRA STATE

[2]DEPARTMENT OF COMPUTER SCIENCE, NNAMDI AZIKIWE UNIVERSITY, AWKA, ANAMBRA STATE

ABSTRACT

This report is the work description of maintenance of passive and active equipment in base Transceiver Stations within a particular cluster. The essence of this work is to ensure that no outage was recorded as a result of failure on any passive and active equipment my duties includes carrying out preventive/corrective maintenance and ensuring 99% availability of the network within a cluster in MTN network across Awka North and South under Asaba region that is made up of Anambra, Imo and Delta State.

Keywords: Passive Equipment, Active Equipment, Transceiver Stations, Cluster,

INTRODUCTION

There have being notable improvement with respect to the communication sector since 2002. This has resulted to the drastic increase in both the number of active subscriptions and tele-densities from the meager 350,000 active lines and tele-density of 0.43 in 2002 to the 150,262,066 active lines and a tele-density growth of 109.65% as of October 2016 with the number of active lines and connected lines clocking a total of 153,514,107 and 230,153,092 respectively and these are expected to continue increasing [1].

This caused the fast and huge deployment of such related procured equipment and infrastructure/facilities as, Base stations, mast/towers, transmitting antennas, the power generating sources etc for both the data and voice transmissions across this country. The major concern in Nigeria is the national power grid supply which has affected the costs and reliability of GSM telecommunication operations. Many of these sites are off-grid and they are in most cases powered by diesel generators which attract a high operating expenses. The poor quality of power supply and

also the frequent long staying outages seriously affects the remaining grid connected sites which has encouraged high dependence on diesel generators for the grid connected sites. This also made the operators and tower companies struggle with a very expensive power which is not reliable for the existing networks. When diesel is made the main power source for base stations, or used to backup for an unreliable grid, it will be difficult to justify it both environmentally and economically.

METHODOLOGY

Basic Tasks and Equipment Used in Passive Network Operations:

The Maintenance of cell sites which will ensure that there is minimum down time and within the SLAs specified by the customer. The payment of electricity bills as at when due. Providing diesel in DGs In case of DG failure there should be mobile Backup in DGs Corrective, Preventive and Routine maintenance of DG sets, ACs and Electrical/Utility The maintenance of the secondary batteries to assist with the availability of backup power. Proper cleanliness, upkeep and housekeeping at telecom sites. Rain readiness activities. Scheduling & implementation of preventive, corrective maintenance of BTS The verification of resolution on troubled tickets. For spares, the logistic supports are provided. The repair and recovery of the faulty parts is the Program management Reporting periodically the fault handling to the NOC till its resolved. At Whales, we provided flexible, integrated, dependable, cost effective and responsive solutions for the Operation and Maintenance requirements of telecom operators in Nigeria. We delivered the highest possible performance and reliability in network availability as well as minimum downtime for our customers.

Basic Tasks and Equipment Used in Active Network Operation:

Maintenance of base transceiver station comprising of: 2G network (GSM) 3G network (WCDMA) And 4G network (LTE) Carrying out preventive maintenance, corrective maintenance and installation.

Fig 1.0: A typical Baseband unit for Base Transceiver Station

Maintenance of Telecommunication Network can be briefly classified into two types:

Preventive Maintenance: The responsibility of the Site preventive maintenance covers the failure prevention maintenance on all the Network elements which is been mentioned here to enable the provision of optimum life / infrastructure/ service cycle of active / passive equipment[2]. These are planned work that are carried out either weekly, monthly or yearly.

Corrective Maintenance: The responsibility of the Site correction maintenance covers the failure correction maintenance on all the network elements [2]. Passive/infrastructure Equipment Maintenance Include: Alarms and NMS: Sensors, Internal Alarms, External Alarms etc Energy Solar, Lighting, Battery, Grid Power Line, Grounding, Grid Transformer, Generator, PIU, AVR Cooling Air Conditioning Construction Tower, Fence, Building/Shelter, BTS Room, Foundations, Roof Conditions, Site Access, Grounding including Bus, Record

Tasks Carried Out Under Ericsson Technologies Nigeria Limited: Managing the entire gamut of maintenance and operations and Project Management to ensure the network availability >= 99.999%. The tables below shows that downtime which is allowed for a particular percentage of availability and also presuming that the system is expected

to continuously be operating. Service level agreements (SLA) which is often refered to as monthly downtime exist in order to calculate service credits to tally with the actual monthly billing cycles. The following table show the translation from a given availability percentage to the corresponding amount of time a system would be unavailable.

Table 1.0: Availability Percentage to the Corresponding Amount of Time a System is Unavailable.

Availability (%)	**Downtime (per year)**	**Downtime (per month)**	**Downtime (per week)**	**Downtime (per day)**
55.5555555	162.33 days	13.53 days	74.92 hours	10.67 hours
90	36.53 days	73.05 hours	16.80 hours	2.40 hours
95	18.26 days	36.53 hours	8.40 hours	1.20 hours
97	10.96 days	21.92 hours	5.04 hours	43.20 minutes
98	7.31 days	14.16 hours	3.36 hours	28.80 minutes
99	3.65 days	7.31 hours	1.68 hours	14.40 minutes
99.5	1.83 days	3.65 hours	50.40 minutes	7.20 minutes
99.8	17.53 hours	87.66 minutes	20.16 minutes	2.88 minutes
99.9	8.77 hours	43.83 minutes	10.08 minutes	1.44 minutes
99.95	4.38 hours	21.92 minutes	5.04 minutes	43.20 seconds
99.99	52.60 minutes	4.38 minutes	1.01 minutes	8.64 seconds
99.995	26.30 minutes	2.19 minutes	30.24 seconds	4.32 seconds
99.999	5.26 minutes	26.30 seconds	6.05 seconds	864.00 milliseconds
99.9999	31.56 seconds	2.63 seconds	604.80 milliseconds	86.40 milliseconds
99.99999	31.16 seconds	262.98 milliseconds	60.48 milliseconds	8.64 milliseconds
99.999999	315.58 milliseconds	26.30 milliseconds	6.05 milliseconds	864.00 milliseconds
99.9999999	31.56 milliseconds	2.63 milliseconds	604.80 milliseconds	86.40 milliseconds

- Leading the operations and maintenance team in an efficient, optimized, cost effective way, orientation towards KPI's, SLAs.
- The management of the operations for a smooth and seamless running of the daily activities which includes the following and more; surveillance management, fuel management, etc.
- The control and monitoring of the consumed energy and loss-making sites to maintain the cost and site stability.
- The monitoring of the performance of the equipment and its preventive maintenance.
- The troubleshooting, implementation of the corrective actions and root cause analysis to avoid the repetition of breakdowns.
- Execution of a comprehensive operation and also giving support by maintaining the following and many more; fault monitoring, handling, etc.
- Performing any other related duties as required. Ensure reduction in fuel consumption by close monitoring of the system. Ensure timely escalations of issues occurring at each site.
- Organizing safety training for field staff. Ensure safety guidelines are followed.
- Identifying high diesel consumption sites and their remedy action.
- Planning, creating and coordinating work schedule for maintenance team.

Common Passive problems and how they are resolved Due to the very pathetic state of electricity in Nigeria, most telecom sites have generators as the primary source of power for the transmission equipment, these generators run for 24 hours in most cases are serviced either weekly or monthly depending on the servicing kit whether 250 hours kit for weekly servicing or 100 hours kit for monthly servicing. Generator Failure: Batteries: Battery failure is the most common failure when it comes to generators. Always make sure the batteries, charges, and all cables and connections leading to;fro are in good condition. Failure to Start: If a generator doesn't start, one of the causes might be that the controls are not set to auto.

If the main control switch which is supposed to be on the "on" position has been placed in the "off/reset" position. In such scenario, the generator won't start automatically when required. Running out of fuel: sometimes, fuel gauges might not properly show the fuel levels and when this happens, it will result to the generators running out of fuel. It's advisable to check fuel levels manually and maintain onsite-storage or any other reliable means of securing fuel for emergency.

Routine Generator Servicing involves:

Changing the air filter

Changing the oil filter

Changing the fuel filter

Changing the oil Belt replacement

Water level check and topping if necessary

When there is an understanding of the most common generator problems and planned maintenance involved, prevention of downtime becomes easier. A regular inspection and a routine maintenance of the generator helps to avoid many of these commonly known issues from happening. High Temperature: High temperature is often as a result of air conditioner failure, routine air conditioner servicing is often carried out to ensure that outage is averted due to high temperature.

Routine Air Conditioner Servicing involves: Shut off the power Remove debris Clean the fins Clean area around the unit Change the blower filter Refill gas if necessary By ensuring air conditioners are serviced on regular bases, downtime due to shelter high temperature is eliminated. Common Active Problem: Faulty Transmission Card: This is mostly as a result of longtime usage, fault as a result of excess voltage/under voltage to the system, fault as a result of fluctuating voltage which can lead to loss of the card or electronic board as the case maybe. Some of the boards are MMU (Main Module Unit), NPU (Node Processing Unit) fan unit, RFU (Radio Frequency Unit) etc.

Loss of Configuration: This is a cause where the configuration or file save in a card or network is said to be missing where causing no communication with the back office/Network Operating Centre (NOC) and perceived to be network failure. Fiber Failure: This is a cause where the fiber option cable transferring resources from the Base Service Center (BSC) to Base Transceiver Station (BTS) has been tampered or mechanically damaged.

CONCLUSION

This paper has successfully shown progress made by some of the Nigerian telecommunication tower owners and site managers in the area of steady power supply to base transceivers stations. However, there are a lot of efforts and competitions between the tower owners and site managers to manage the diesel consumption rate of telecommunication sites to the lowest minimum and also maintain steady power supply across the sites considering the economic situation of Nigeria. It is also a known fact that the majority of down-time or site down experienced across Nigeria is as a result of power failure, critical research should continue, directed towards discovering and deploying alternative, cheaper and sustainable energy sources and grids for use in telecommunication complexes across Nigeria.

REFERENCES

[1] Oyedepo, S. O., (2012). Energy and Sustainable Development in Nigeria: The Way Forward.

[2] Akinbami, J.F.K., (2001) Renewable Energy Resources and Technologies in Nigeria: Present Situation, Future Prospects and Policy Framework. Mitigation and Adaptation Strategies for Global Change.

[3] Oji, J.O., Aliu, T.O., Petinrin, M.O., Idusuyi, N., Adejobi, O.A., Adetunji, A.R., (2012). Utilization of Solar

Energy for Power Generation in Nigeria.

[4] Daramola, O., (2012). Renewable Energy Market Analysis in Nigeria.

[5] John, W.T., Anthony, D.W., (1987) 'Renewable Energy Resource' University Press, Cambridge, England.

[6] Oladosu, G.A., Adegbuluge, A.O., (1994) 'Nigeria's Energy sector. Issues and Supply/Demand Frontiers. 'Energy Policy, 22(6):538-549.

[7] Anthony A., (2013), Promoting Renewable Energy Use in Nigeria. Vanguard Newspapers.

[8] Ewesor. P.O., (2011), Renewable Energy Profile in Nigeria with Focus on Small Hydro Power.

[9] Energy Commission of Nigeria (ECN): Renewable Energy Master Plan (2005).

[10] Council for Renewable Energy, Nigeria (CREN): (2009). Nigeria Electricity Crunch.

[11] Energy Commission of Nigeria (2013), National Energy Policy of the Federal Republic of Nigeria.

[12] B.L Theraja, Fundamentals of Electrical Engineering and Electronics

[13] B.L. Theraja, Basic electrical Engineering (Vol.1)