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Load Flow Analysis of Ordinance Area Trans-Amadi Port Harcourt Using Gauss Seidel Technique for Improvement.

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ABSTRACT

Power flow analysis is the backbone of power system analysis and design. It is important for planning of future expansion of power system as well as determining the best operating condition of the existing system. The principal information of power flow analysis is to find the magnitude and phase angle of voltage at each bus and the real and reactive power flowing in each transmission lines. This study examined the existing electrical power network for Ordinance area, Trans-Amadi Port Harcourt distribution network which consists of four (4) 11kV distribution feeders namely; Waterworks, Fimie, Ndabros and Rivoc. The distribution network was modelled in Electrical Transient Analyser Program (ETAP) using Gauss-Seidel power flow equation. Power flow analysis was conducted for both existing network and modified network using transformer tapping and capacitor bank optimization method. The results were analysed, under-voltage buses, overloaded transformers and feeders were identified. Voltage level below 95% was taken as under voltage and transformer loading above 60% are taken as overloading. The reasons for the under-voltage and overloading were identified and two (2) optimization techniques were used to improve the network and to know which of the techniques is better. According to the simulation results, the effects of all bus voltages changed and improved above the acceptable range which is 100% because of varying of the best condition of tap ratio. When the capacitor bank under optimum value was installed at the weakest buses, the voltage of those buses were increased between 97.65% and 100.94%.

Keywords *– transformer tapping, capacitor bank optimization, overloading, buses*

I. INTRODUCTION

The demand for electrical power always exceeds the supply especially in the developing countries like Nigeria, resulting to undesirable power sharing thereby causing wasteful power supply system. Generally, in Nigeria, factors contributing to inefficient and unreliable power supply apart from low power generation may include poor or ineffective voltage control system, poor transmission networks, highly overloaded transmission feeders due to lack of planning, faulty distribution system on the part of the electrical suppliers, voltage drop along the line and from the distribution system due to the flow of current and load variations on the consumer end, damage to substation, transmission and distribution network, short circuit or overloading of electrical mains, and tripping of power system. These shortcomings over the years have resulted to unreliable and spurious voltage variations and frequent power outages. An Efficient power supply system is one that seeks to overcome the above shortcomings and delivered better quality of power to local consumers and industrial users [1].

Load flow study is the study of the steady state solution of the power system network. The important information obtained from this study are essentially the magnitudes and phase angles of load bus voltages, active and reactive powers at generator bus, real power flow on transmission lines and voltage phase angles at specified bus bars. The information obtained from the above analysis are mainly used in continuous monitoring of the present state of the system and for analyzing the effectiveness, security constraints and economic considerations of alternative plans for future system expansion in order to achieve the increased demand of load. Load flow solution is the primary requirement for designing a new power system and for planning an extension of the existing one for increasing demand [2].

For distribution system the power flow analysis is a very important and fundamental tool. Its results play the major role during the operational stages of any system for its control and economic schedule, as well as during expansion and design stages. The purpose of any load flow analysis is to compute precise steady-state voltages and voltage angles of all buses in the network, the real and reactive power flows into every line and transformer, under the assumption of known generation and load. During the second half of the twentieth century, and after the large technological developments in the fields of digital computers and high-level programming languages, many methods for solving the load flow problem have been developed, such as Gauss-Siedel (bus impedance matrix), Newton-Raphson‘s (NR) and its decoupled versions. Nowadays, many improvements have been added to all these methods involving assumptions and approximations of the transmission lines and bus data, based on real systems conditions [1]

Gauss-Siedel solution method was used to carry out the analysis in this work, because of its fast convergence and simplicity attribute as compared to other solution methods using the relevant data as obtained from Port Harcourt Electricity Distribution Company (PHEDC). The approach utilized here is a load flow technique where the distribution network under analysis is modelled in Electrical Transient Analyzer Program (ETAP). It is a powerful graphical user interfaces power system simulation software capable of modelling and simulating power system network.

II. RELATED WORKS

In a three-phase ac power system, active and reactive power flows from the generating station to the load through different networks buses and branches. The flow of active and reactive power is called power flow or load flow. Power flow studies provide asystematic mathematical approach for determination of various bus voltages, their phase angles, active and reactive power flows through different branches, generators and loads under steady state condition. Power flow analysis is used to determine the steady state operating condition of a power system. Power flow analysis is widely used by power distribution professional during the planning and operation of power distribution system [3]

Commercial power systems are usually too complex to allow for hand solution of the power flow. Special purpose network analysers were built between 1929 and the early 1960s to provide laboratory-scale physical models of power systems. Large-scale digital computers replaced the analogue methods with numerical solutions. In addition to a power-flow study, computer programs perform related calculations such as short-circuit fault analysis, stability studies (transient and steady-state), unit commitment and economic dispatch [4].

The incessant power failure and inadequate power supply from the central generation down to the consumers suffer a lot of sets back; researchers, technologist, etc., have resort to other means of remedying the setback. In literature, different approaches has been implemented to provide an effective solution in regards to reliable power generation and delivery. Presently, the impact of distributed generation linked to the distribution networks are on course. Distributed generation units have several benefits such as stability, reliability, and economy; but it suffers some critical problems that may disturb these benefits as seen in [5].

In the past decades, a mass of methods to solve the distribution power flow problem have been developed and well documented. These methods can be roughly categorized as node-based methods and branch-based methods. The first category used node voltages or currents injection as state variables to solve power flow problem. In this category, the most notable methods include network equivalence method, Z-bus method, Newton-Raphson‘s algorithm, Fast Decoupled algorithm. The second category utilized branch currents or branch powers as state variables to solve power flow problem. The backward/forward sweep based methods and loop impedance methods can be categorized in this group [6].

III. METHODOLOGY

Usually, Alternating Current (AC) generation voltage in the world using either thermal or hydropower generating system is between 10.5-28kV with operating frequency of 50Hz or 60Hz [7]. Nigeria is within the range above. Generators rated terminal voltage are 10.5KV, 11KV, 11.5KV and 16KV with operating frequency of 50Hz

The Nigeria Power Grid Network (NPGN) voltage is 330KV, primary transmission. Sub-transmission Network (STN) voltage is 132KV, secondary transmission.

Primary Distribution Feeders (PDF) voltage is 33KV (primary distribution voltage) to various injection substations for further distribution in Nigeria. Secondary Distribution Feeders (SDF) voltage is 11KV to various consumers on point load and consumers down the street and roads through overhead lines and underground cables.

This section comprises of 11/0.415KV transformers that received power from the secondary distribution network on (11KV) and distribute power to consumers on the tertiary distribution network (4-wire network).

The major data source for this research work is Port Harcourt Electricity Distribution Company (PHEDC). In the course of study, gathering of important data of different types is an essential task, various books and theories have been referred to. The data gathered are: installed capacity of transmission sub-station, installed capacity of injection sub-station, examined feeders, total number and power rating of distribution transformers and single line diagram of power distribution network for Ordinance area, Trans-Amadi, Port Harcourt. Gauss-Seidel Method will be used for computing bus voltages and the simulation on each of the feeders will be carried out using ETAP software.

The distribution of electricity to the load centres within the network is done through the respective 11KV feeders. The examined feeders in this study are; Rivoc feeder which supplies power to Total Gospel Street, Salvation Close, Joe Alaogoa Street, Danjuma Close, Professor Okujagu road, Peter Odili road, Hon. Gideon road, Judiciary Quarters, Royal Avenue, Oil view road, Emmanuel Street and Elizabeth Alfred Close. Fimie feeder supplies power to some parts of Ordinance road, V-Hotel road, Unity road, Black Estate, Mission road, TMC Estate, Ozuboko Estate, Emmanuel Avenue, Blessing Close and Gudi Street. Ndabros feeder supplies power to Bewac road, Ella Estate, Fidil Avenue, Gibs Lane, Mingi road, Christian Council and Anglican Church. Waterworks feeder supplies power to Rockson Engineering, Mothercat, Innka by Trevi Company, JC & Jenny, Jenny & Jenny and the remaining part of Ordinance road.

Table 3.1: Details of Examined Feeders

Examined Feeders	**Route Length (km)**	**Conductor Size (mm^2)**	**Conductor Type**	**No. of Distribution Transformer (KVA)**				
				500	**300**	**200**	**100**	**50**
Rivoc	17.52	150	Aluminium	24	5	1	-	-
Waterworks	1.98	150	Aluminium	4	3	-	-	-
Ndabros	5.195	150	Aluminium	7	3	-	-	-
Fimie	20.12	150	Aluminium	12	4	1	-	-

Source: Port Harcourt Electricity Distribution Company (PHEDC)

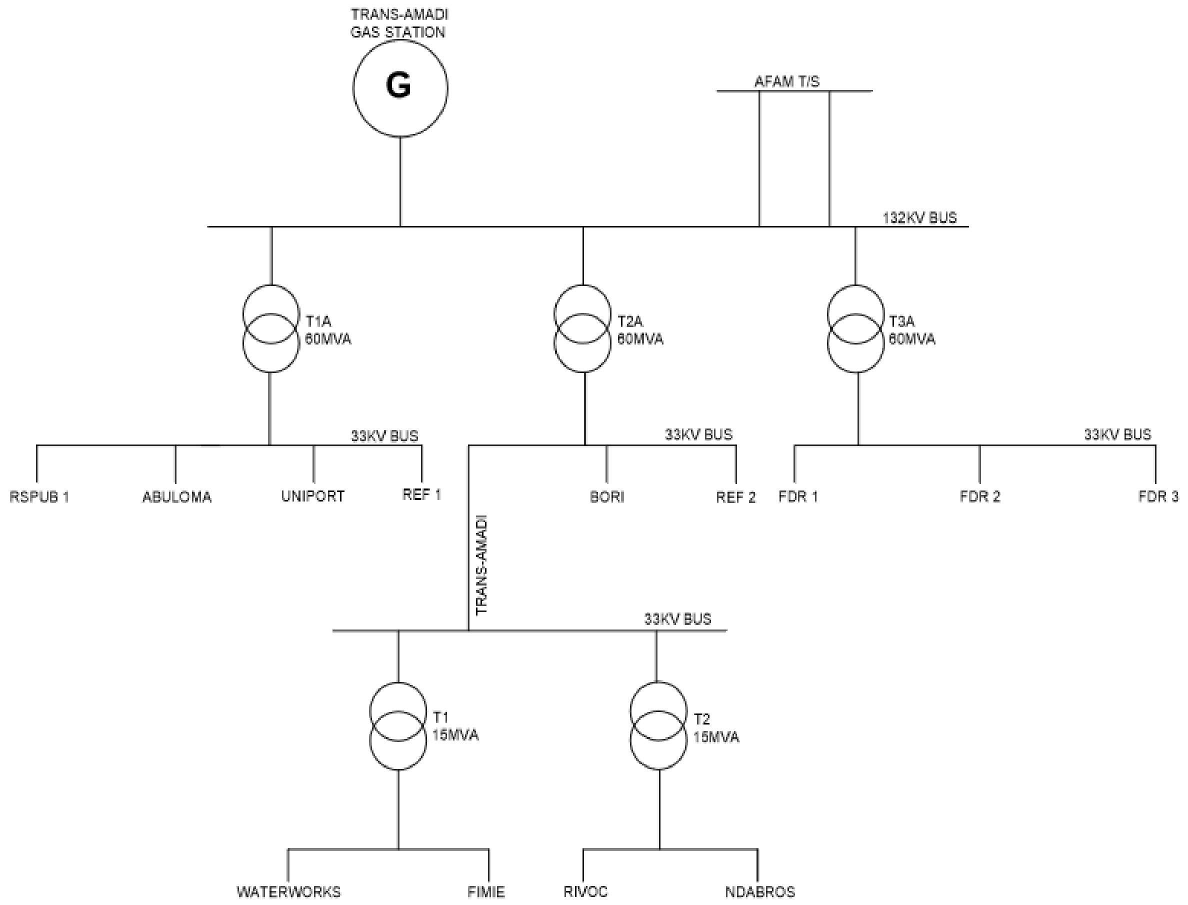

Figure 3.1: The Existing Network under Study

Source: Port Harcourt Electricity Distribution Company (PHEDC)

3.1 DETERMINATION OF OVERLOADED TRANSFORMER

The apparent power performance index is used to determine the percentage loading of transformers in the network. Based on the principle of loading of distribution transformers being 60% on rating for design purpose, transformers with loadings in excess of this figure are considered overloaded.

$$Percentage\ loading = \left[\frac{S_{MVA}}{S_{MAX}}\right] x\, 100 \qquad (3.1)$$

Where; S_{MAX} is the MVA rating of the transformer

S_{MVA} is the operating MVA from power flow calculations.

3.2 DISTRIBUTION LINE PARAMETERS

3.2.1 Resistance of line

$$Resistance, R = \frac{\rho L_o}{A}\ \ ohms \qquad (3.2)$$

3.2.2 Reactance of line per kilometre

$$X_o = 0.1445 \log_{10}\left[\frac{D_{GMD}}{r}\right] + 0.0157\ \ ohms/km \qquad (3.3)$$

Geometric mean distance of conductor

$$D_{GMD} = \sqrt[3]{D_{12}\ x\ D_{13}\ x\ D_{23}}$$

$$D_{12} = D_{13} = D_{23} = D$$

$$D_{GMD} = \sqrt[3]{2D^2D}$$

$$D_{GMD} = \sqrt[3]{2D^3}$$

$$D_{GMD} = D\sqrt[3]{2}$$

$$D_{GMD} = 1.26D \qquad (3.4)$$

Radius of conductor

$$r = \sqrt{\frac{A}{\pi}} \qquad (3.5)$$

3.2.3 Impedance of line per kilometre

$$Z = R + jX \qquad (3.6)$$

3.2.4 Capacitive susceptance of line per kilometre

$$B_o = \frac{7.5}{\log_{10}\left[\frac{D_{GMD}}{r}\right]}\ x\ 10^{-6} \qquad (3.7)$$

3.2.5 Conductance of line

$$G = \frac{1}{R} \qquad (3.8)$$

3.2.6 Admittance of line per kilometre

$$Y = G + jB \qquad (3.9)$$

Where;

ρ = Resistivity of Aluminium = 2.8 x 10^{-8} ohm/m

L_o = Route length of the feeder (km)

A = Area of conductor = 150mm^2

R = Resistance of the line

X_o = Reactance of the line

D_{GMD} = geometric mean distance of conductor

r = Radius of the conductor

D = Distance between adjacent conductors = 0.762m (horizontal spacing)

Z = Impedance of the line

B_o = Susceptance of the line

Y = Admittance of the line

G = Conductance of the line

3.2.7 Distribution Line Parameters Calculations

Geometric mean distance of conductor

$$D_{GMD} = 1.26D$$

$$= 1.26 \; x \; 0.762$$

$$\boldsymbol{D_{GMD} = 0.9601m}$$

Radius of conductor

$$r = \sqrt{\frac{A}{\pi}}$$

$$= \sqrt{\frac{150 \; x \; 10^{-6}}{3.142}}$$

$$= \sqrt{0.00004774}$$

$$\boldsymbol{r = 0.0069m}$$

Reactance of line per kilometre

$$X_o = 0.1445 \log_{10}\left[\frac{D_{GMD}}{r}\right] + 0.0157$$

$$= 0.1445 \log_{10}\left[\frac{0.9601}{0.0069}\right] + 0.0157$$

$$= 0.1445 \log_{10}[139.14] + 0.0157$$

$$= 0.3097 + 0.0157$$

$$\boldsymbol{X_o = 0.3254 \; ohm/km}$$

Capacitive susceptance of line per kilometre

$$B_o = \frac{7.5}{\log_{10}\left[\frac{D_{GMD}}{r}\right]} \; x \; 10^{-6}$$

$$= \frac{7.5}{\log_{10}\left[\frac{0.9601}{0.0069}\right]} \; x \; 10^{-6}$$

$$B_o = \frac{7.5}{\log_{10}[139.14]} \; x \; 10^{-6}$$

$$= \frac{7.5}{2.1435} \; x \; 10^{-6}$$

$$\boldsymbol{B_o = 3.4990 \; x \; 10^{-6} S/km}$$

3.3 DETERMINATION OF PERCENTAGE VOLTAGE REGULATION

The source voltage and end voltage are used to calculate the percentage voltage regulation of Rivoc, Waterworks, Ndabros and Fimie 11KV feeders.

The acceptable standard of percentage voltage regulation is below 5% but anything above 5% is regarded as high and as such customers fed by the transformers connected at this point will experience low voltage.

$$Voltage\ drop, V = IZ \tag{3.10}$$

$$End\ Voltage, V_{end} = Source\ Voltage, V_s - Voltage\ drop, V \tag{3.11}$$

$$V_{end} = V_s - V \tag{3.12}$$

$$Percentage\ Voltage\ Regulation = \frac{Source\ Voltage - End\ Voltage}{Source\ Voltage}\ x\ 100\% \tag{3.13}$$

$$= \frac{V_s - V_{end}}{V_s}\ x\ 100\% \tag{3.14}$$

Where;

I = Current flowing through the feeder

Z = Impedance of the feeder

V = Voltage drop of the feeder

V_s = Voltage at the source

V_{end} = Voltage at the end

IV. RESULTS AND DISCUSSIONS

4.1 COMPARISON OF THE THREE STATE OF THE NETWORK SIMULATION

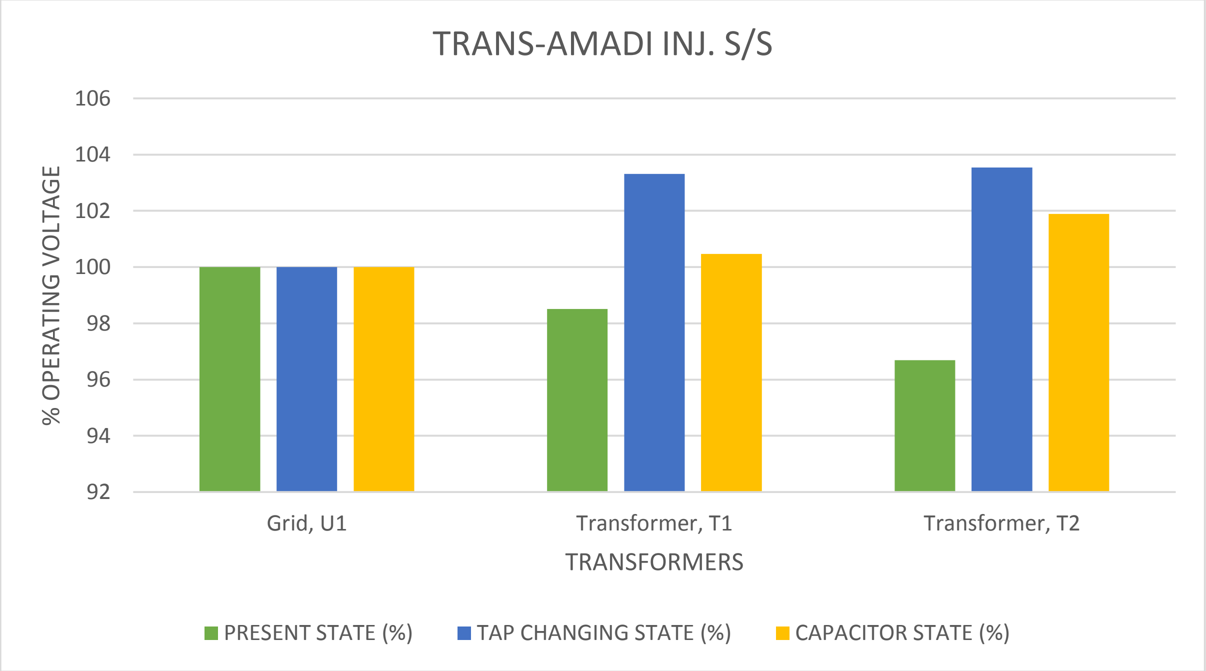

Figure 4.1: Graph Showing Present and Improved States of Trans-Amadi Injection Sub-station

The graph of voltage performance index for the present state of the network condition for Trans-Amadi injection sub-station shows that Transformer, T2 bus is operating below 98% of the nominal voltage. Transformer load tap changing was done on the primary side of the transformer and the voltage profile of the buses was improved to 103%. Capacitor banks were also used in the network and the bus voltage was improved to a more acceptable value which is close to a 100%. The graph also show that despite the method of improvement used, the grid bus voltage remained the same. (See Appendix 1)

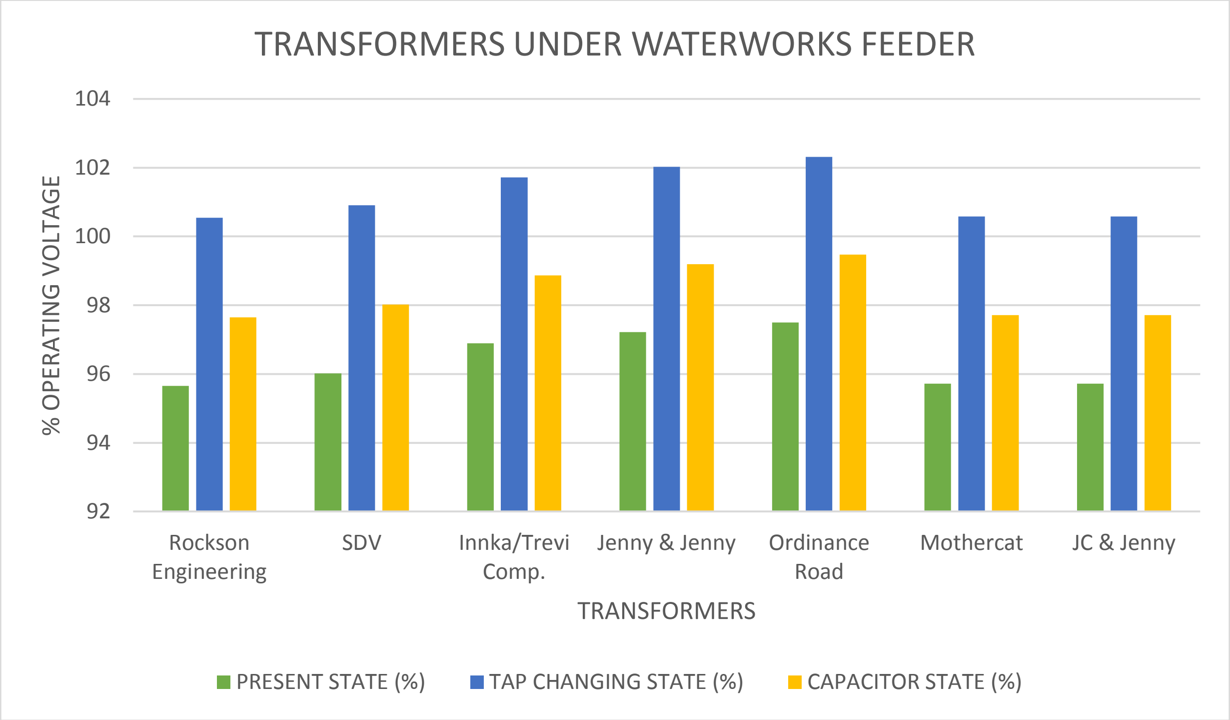

Figure 4.2: Graph Showing Present and Improved States of Waterworks 11kV Feeder

The graph of voltage performance index for the present state of the network condition for Waterworks 11kV feeder shows that the buses are operating below 98% of the nominal voltage. Transformer load tap changing was done on the primary side of the transformer and the voltage profile of the buses was improved to between 100.54% - 102.31%. Capacitor bank was also used in the network and the bus voltage was improved to a more acceptable value which is within 97.65% - 99.47%. (See Appendix 2)

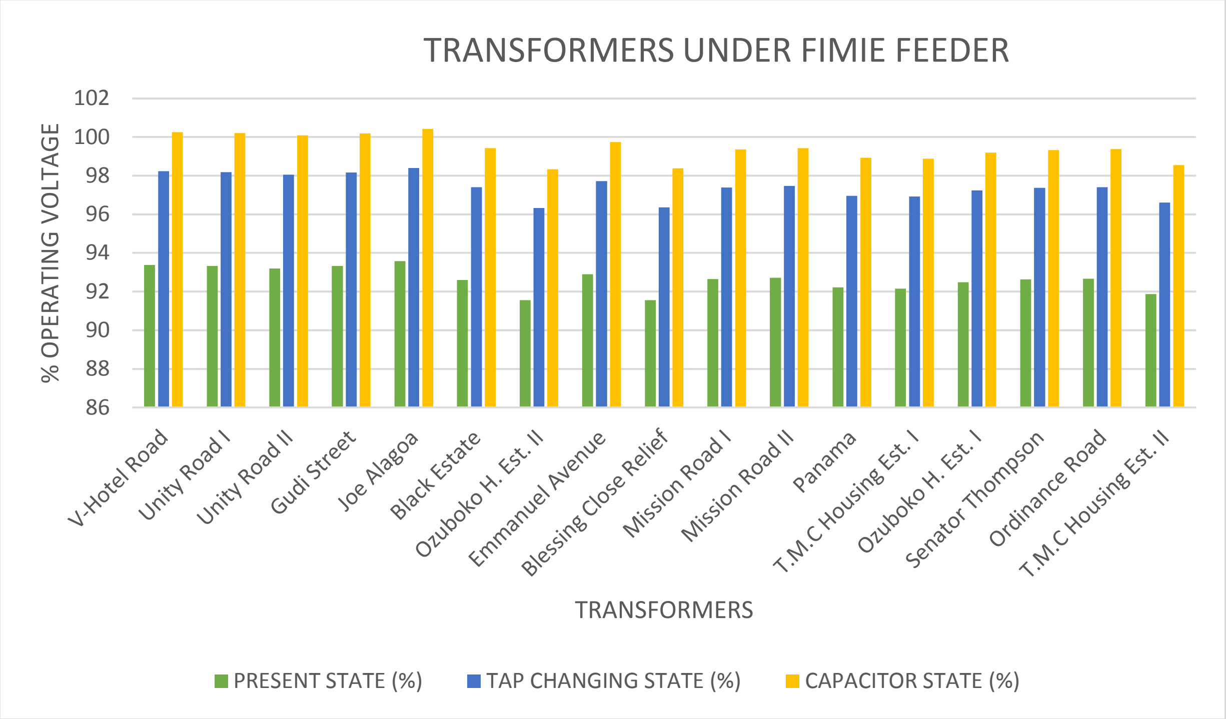

Figure 4.3: Graph Showing Present and Improved States of Fimie 11kV Feeder

The graph of voltage performance index for the present state of the network condition for Fimie 11kV feeder shows that the buses are operating below 95% of the nominal voltage. Transformer load tap changing was done on the primary side of the transformer and the voltage profile of the buses was improved to between 96.33% - 98.39%. Capacitor bank was also used in the network and the bus voltage was improved to a more acceptable value which is within 98.33% - 100.41%. (See Appendix 3)

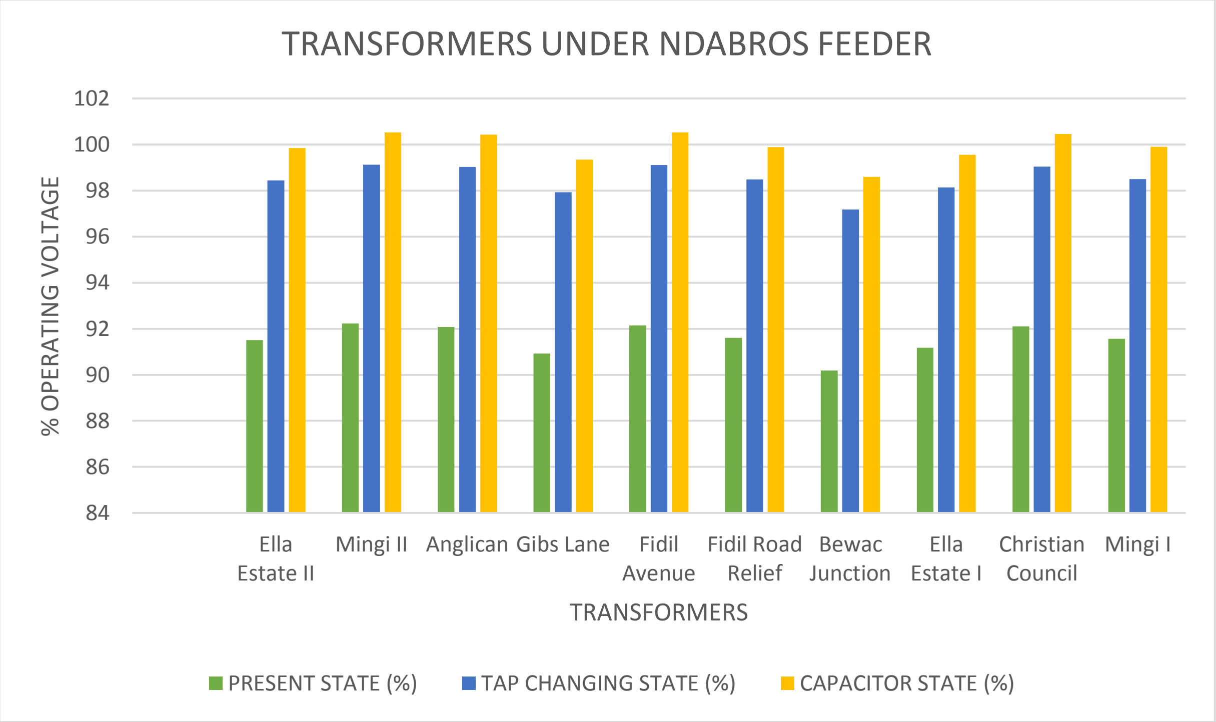

Figure 4.4: Graph Showing Present and Improved States of Ndabros 11kV Feeder

The graph of voltage performance index for the present state of the network condition for Ndabros 11kV feeder shows that all the buses are operating below 95% of the nominal voltage. Transformer load tap changing was done on the primary side of the transformer and the voltage profile of the buses was improved to between 97.18% - 99.12%. Capacitor bank was also used in the network and the bus voltage was improved to a more acceptable value which is within 98.59% - 100.52%. (See Appendix 4)

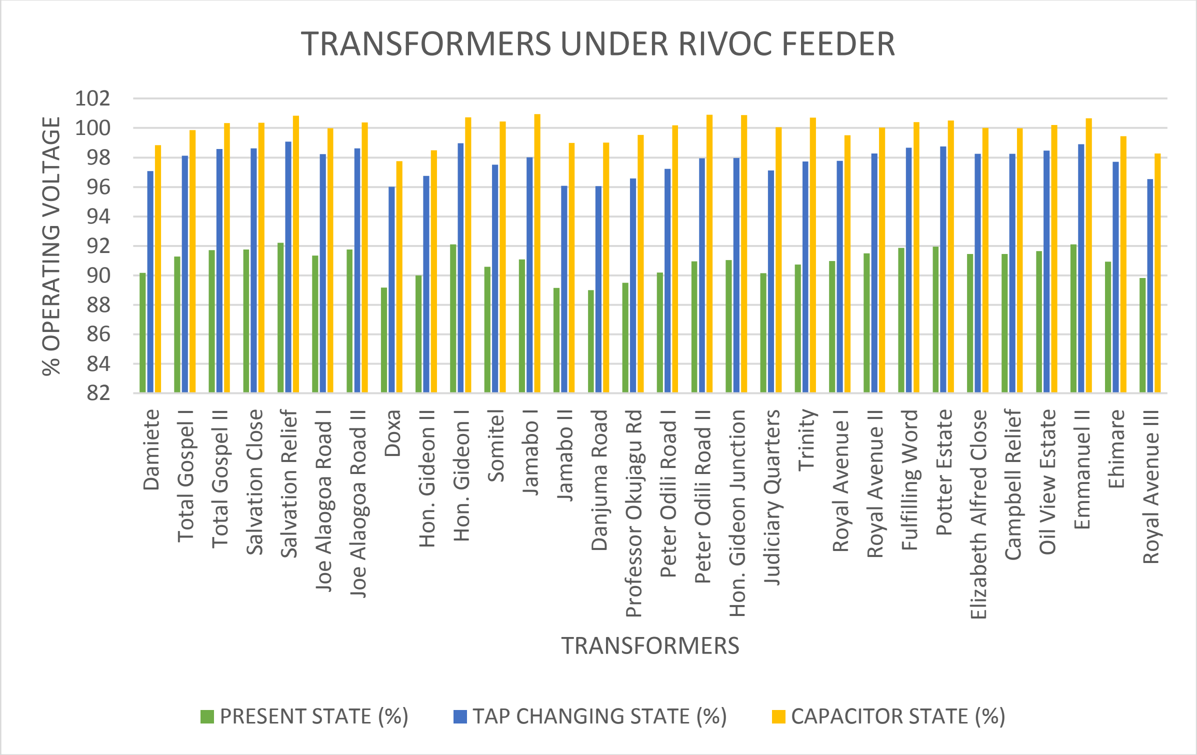

Figure 4.5: Graph Showing Present and Improved States of Rivoc 11kV Feeder

The graph of voltage performance index for the present state of the network condition for Rivoc 11kV feeder shows that all the buses are operating below 95% of the nominal voltage. Transformer load tap changing was done on the primary side of the transformer and the voltage profile of the buses was improved to between 96.01% - 99.08%. Capacitor bank was also used in the network and the bus voltage was improved to a more acceptable value which is within 97.75% - 100.84%. (See Appendix 5)

V. CONCLUSION

5.1 CONCLUSION

This study examined the existing electrical power network for Ordinance area, Trans-Amadi Port Harcourt distribution network which consists of four (4) 11kV distribution feeders namely; Waterworks, Fimie, Ndabros and Rivoc. The distribution network was modelled in Electrical Transient Analyser Program (ETAP) using Gauss-Seidel power flow equation. Power flow analysis was conducted for both existing network and modified network (transformer tapping and capacitor bank optimization method).

The results were analysed, under-voltage buses, overloaded transformers and feeders were identified. Voltage level below 95% was taken as under voltage and transformer loading above 60% are taken as overloading. The reasons for the under-voltage and overloading were identified and two (2) optimization techniques were used to improve the network and to know which of the techniques is better. According to the simulation results, the effects of all bus voltages changed and improved above the acceptable range because of varying of the best condition of tap ratio. When the capacitor bank under optimum value was installed at the weakest buses, the voltage of those buses were increased within the acceptable range. Therefore, applying capacitor banks are more reasonable than transformer tapping because capacitor banks are designed for long-term use due to their no moving parts, low initial cost, minimal maintenance costs and they are compact, reliable and highly efficient.

Based on the findings, it can be concluded that power flow studies is important for planning of future expansion of power system as well as determining the best operating condition of the existing system. Up-gradation of distribution transformers, transformer load tap changer and feeder bifurcation were found to be effective in improving voltage profile of the weak buses, reduce losses and eliminate overloading from the system.

REFERENCES

[1]. Idoniboyeobu, D. C. & Ibeni, C. (2017). Analysis for Electrical Load Flow Studies in Port Harcourt, Nigeria, Using Newton Raphson Fast Decoupled Techniques, *American Journal of International Research (AJER)*, 6 (12), 230-240.

[2]. Naseer, M., Waqas, K. & Waqar, K. (2011). Simulation of Load Flow Analysis of Power Plant Network Using Power System Stabilizer in MATLAB/SIMULINK, Sarhad University of Science and Information Technology.

[3]. Bhabani, S. H. & Amit, K. M. (2011). Load Flow Study in Power System. Department of Electrical Engineering National Institute of Technology, Rourkela-769008

[4]. Low, S. H. (2013). Convex relaxation of optimal power flow: A tutorial, IREP Symposium Bulk Power System Dynamics and Control - IX Optimization, Security and Control of the Emerging Power Grid, pp. 1–06.

[5]. Jayaprakash, J., Angelin, P. M., Jothilakshmi, R. & Juanola, P. J. (2016). Planning and Coordination of Relay in Distribution System using ETAP. *Pakistan Journal of Biotechnology*, 252-256.

[6]. Kuldeep, S. & Suman, B. (2009). Fast Decoupled Power Flow for Unbalanced Radial Distribution System, Electrical & Instrumentation Engineering Department, Thapar University, Patiala-147004.

[7]. Dharma, T. (2011). Electrical Interview Questions & Answers: Why Generation Voltage in Power Plant is Low (11KV to 33KV), from: http://electricalquestionsguide.blogspot.com.ng/2011/03/why-generation-voltage-in-powerplant.html

[8].

APPENDIXES

Appendix 1: Comparison between the Three States for Trans-Amadi Injection Sub-station

S/N	BUS NAMES	RATED VOLTAGE (kV)	PRESENT STATE (%)	TAP CHANGED STATE (%)	CAPACITOR STATE (%)
1.	Grid, U1	33	100.00	100.00	100.00
2.	Transformer, T1	11	98.51	103.31	100.47
3.	Transformer, T2	11	96.69	103.54	101.89

Appendix 2: Comparison between the Three States for Waterworks 11kV Feeder

S/N	TRANSFORMER NAMES	RATED VOLTAGE (kV)	PRESENT STATE (%)	TAP CHANGING STATE (%)	CAPACITOR STATE (%)
1.	Rockson Engr	0.415	95.65	100.54	97.65
2.	SDV	0.415	96.02	100.91	98.02
3.	Innka/Trevi Comp.	0.415	96.89	101.72	98.87
4.	Jenny & Jenny	0.415	97.22	102.02	99.19
5.	Ordinance Road	0.415	97.50	102.31	99.47
6.	Mothercat	0.415	95.72	100.58	97.71
7.	JC & Jenny	0.415	95.72	100.58	97.71

Appendix 3: Comparison between the Three States for Fimie 11kV Feeder

S/N	TRANSFORMER NAMES	RATED VOLTAGE (kV)	PRESENT STATE (%)	TAP CHANGING STATE (%)	CAPACITOR STATE (%)
1.	V-Hotel Road	0.415	93.38	98.23	100.26
2.	Unity Road I	0.415	93.33	98.18	100.21
3.	Unity Road II	0.415	93.20	98.05	100.08
4.	Gudi Street	0.415	93.32	98.16	100.18
5.	Joe Alagoa	0.415	93.57	98.39	100.41
6.	Black Estate	0.415	92.60	97.41	99.42
7.	Ozuboko H. Est. II	0.415	91.55	96.33	98.33
8.	Emmanuel Avenue	0.415	92.89	97.72	99.74
9.	Blessing Close Relief	0.415	91.55	96.36	98.38
10.	Mission Road I	0.415	92.64	97.39	99.35
11.	Mission Road II	0.415	92.72	97.47	99.43
12.	Panama	0.415	92.21	96.96	98.92
13.	T.M.C H. Est. I	0.415	92.15	96.92	98.88
14.	Ozuboko H. Est. I	0.415	92.48	97.23	99.19
15.	Senator Thompson	0.415	92.63	97.37	99.32
16.	Ordinance Road	0.415	92.67	97.41	99.37
17.	T.M.C H. Est. II	0.415	91.87	96.60	98.55

Appendix 4: Comparison between the Three States for Ndabros 11kV Feeder

S/N	TRANSFORMER NAMES	RATED VOLTAGE (kV)	PRESENT STATE (%)	TAP CHANGING STATE (%)	CAPACITOR STATE (%)
1.	Ella Estate II	0.415	91.51	98.44	99.85
2.	Mingi II	0.415	92.23	99.12	100.52
3.	Anglican	0.415	92.08	99.02	100.43
4.	Gibs Lane	0.415	90.93	97.93	99.35
5.	Fidil Avenue	0.415	92.15	99.11	100.52
6.	Fidil Road Relief	0.415	91.60	98.49	99.89
7.	Bewac Junction	0.415	90.19	97.18	98.59
8.	Ella Estate I	0.415	91.17	98.14	99.55
9.	Christian Council	0.415	92.10	99.04	100.45
10.	Mingi I	0.415	91.57	98.50	99.90

Appendix 5: Comparison between the Three States for Rivoc 11kV Feeder

S/N	TRANSFORMER NAMES	RATED VOLTAGE (kV)	PRESENT STATE (%)	TAP CHANGING STATE (%)	CAPACITOR STATE (%)
1.	Damiete	0.415	90.18	97.07	98.84
2.	Total Gospel I	0.415	91.28	98.11	99.86
3.	Total Gospel II	0.415	91.71	98.57	100.33
4.	Salvation Close	0.415	91.75	98.61	100.36
5.	Salvation Relief	0.415	92.22	99.08	100.84
6.	Joe Alaogoa Road I	0.415	91.34	98.22	99.98
7.	Joe Alaogoa Road II	0.415	91.76	98.62	100.37
8.	Doxa	0.415	89.18	96.01	97.75
9.	Hon. Gideon II	0.415	89.99	96.75	98.48
10.	Hon. Gideon I	0.415	92.11	98.97	100.73
11.	Somitel	0.415	90.58	97.52	100.44
12.	Jamabo I	0.415	91.08	98.02	100.94
13.	Jamabo II	0.415	89.16	96.09	99.00
14.	Danjuma Road	0.415	89.01	96.06	99.02
15.	Professor Okujagu Rd	0.415	89.50	96.57	99.54
16.	Peter Odili Road I	0.415	90.20	97.23	100.19
17.	Peter Odili Road II	0.415	90.95	97.95	100.90
18.	Hon. Gideon Junction	0.415	91.04	97.96	100.87
19.	Judiciary Quarters	0.415	90.15	97.13	100.06
20.	Trinity	0.415	90.73	97.74	100.70
21.	Royal Avenue I	0.415	90.98	97.77	99.51
22.	Royal Avenue II	0.415	91.49	98.28	100.03
23.	Fulfilling Word	0.415	91.87	98.67	100.41
24.	Potter Estate	0.415	91.96	98.76	100.50
25.	Elizabeth Alfred Close	0.415	91.46	98.26	100.00
26.	Campbell Relief	0.415	91.46	98.25	99.99
27.	Oil View Estate	0.415	91.66	98.46	100.21
28.	Emmanuel II	0.415	92.11	98.91	100.66
29.	Ehimare	0.415	90.93	97.71	99.45
30.	Royal Avenue III	0.415	89.82	96.54	98.27