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Load Evaluation of 11kV Notore Distribution Network Using Newton Raphson Load Flow Technique

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ABSTRACT:

This research examined the existing Notore 11kV distribution network for improved performance using Newton Raphson Load Flow Technique. The network consists of 20 distribution substations (comprising of 4 units of 5.0MVA transformers and 16 units of 1.5MVA transformers) and the power supply is from 25MW gas turbine generator. The voltage level on each section of the distribution network was investigated and weak buses on the network identified. Capacitor bank of 2400KVAR was installed in the entire distribution network to enhance performance. The network was modelled in Electrical Transient Simulation software (ETAP19.1) and load flow performed using Newton-Raphson technique. The result obtained from the existing network simulation shows that Urea/Urea Grad./NPK (92.79%), Workshop/warehouse (92.52%) and Utilities 2 (93.15%) violated the voltage statutory limit condition of between 95% - 105%. After improvement on the network using capacitor bank the operating value was Urea/Urea Gran./NPK (98.48%), Workshop/warehouse (98.15%) and Utilities 2 (98.58%). The reactive power injected optimally into the critically weak buses also improved the voltage profile of the marginally weak buses that were not directly compensated. The proposed capacitor bank optimization impacted significantly when added to the distribution network.

NOMENCLATURE

Abbreviation	Meaning
GRAD	Granulation
NPK	Nitrogen, Posphorous, Potassium
PHED	Port-Harcourt Electricity Distribution Company
GMC	Ghana Manganese Company
MV/LV	Medium Voltage / Low Voltage
VAR	Volt-Amperes Reactive
LTC	Transformer Load Tap Changer
R/X	Resistance to Reactance Ratio

Key words: Load, evaluation, notore, distribution, newton Raphson, load flow.

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I. INTRODUCTION

It is necessary to conduct load flow evaluations in order to guarantee that electrical systems are safe and efficient, and that there are no signs of overloading. When performing a load analysis, you can identify potential problems in the distribution network, such as excessive energy consumption, harmonic interference, and unexpected spikes, that may not be seen during a visual inspection. The Electric Power System is made up of three components: generation stations, transmission stations, and distribution stations. When transferring energy from one end of a transmission line to the other, high voltage transmission lines are utilized in order to minimize losses and optimize the cost of the power transmission infrastructure. As a result, several consumers are supplied with the same voltage through secondary distribution lines (also known as distributors), because distribution transformers lower the voltage to a level appropriate for residential and commercial utilities. According to [1], distribution transformer is a key device which connects the power supply to the consumers. Customer connections to the secondary distribution line are made by service drops, which are located across the city. It is possible that consumers with higher electrical power requirements will be linked directly to the major distribution line or sub-transmission level; however, this is not always the case.

Apart from inadequate power generation, the following factors may be limiting factors in Nigeria: poor transmission feeders, poor or inefficient voltage control system due to a lack of planning, faulty distribution system on the part of the electrical supplier (PHED), voltage drop along and from the distribution system due to the flow of current and load variations at the consumer end, transmission and distribution network, dams, and other infrastructure. Power outages and voltage fluctuations have become more frequent and unstable as a result of these problems. Electrical energy is very essential among the different types of energy for it is an economic indicator and so, government should ensure its availability[2]. Practically speaking, the demand for electrical power always outstrips the supply, particularly in developing countries such as Nigeria.

During the design, operation, and expansion phases of a power distribution and/or transmission system, load flow analysis is a critical instrument to have on your tool belt. It is the goal of any load flow analysis to determine the precise steady-state voltage magnitude and voltage angles of all network buses, as well as the real and reactive power flow into and out of all lines, transformers, and other network components, under a specific generation and load value, and therefore the losses incurred as a result of this process.

1.1 Statement of the Problem

A comparison can be made between the characteristics of the Notore Company's distribution network and those of the Nigerian power sector. When it comes to the electrical power distribution network, low voltage experiences, reactive power deficiency due to high inductive loads, voltage drops due to the distance covered by the transmission line, insufficient power supply from the national grid, poor maintenance on the transmission and distribution lines, and other issues are common. Conducting a thorough and proper load flow study using the Newton Raphson load flow method will be required in order to assess and restore a stable and efficient power supply in the Notore Company by resolving the aforementioned difficulties will be necessary.

The main problem associated with the distribution network has led to:

i. Unreliable and inefficient power supply to the power distribution system of the industrial city.
ii. Low voltage profile in some parts of the distribution system.
iii. Overheating of electric motors due to increased current flow and hence its rapid deterioration.
iv. Failure to supply the adequate quality of power output may at times cause total shutdown of the industries which will make a major financial loss to the business.
v. Economic losses resulting from incessant replacement of burnt electric motors.

1.2 Significance of the Study

The significance of this research study are:

i. Improvement of the electric power Distribution system to enhance power reliability.
ii. To regulate the distribution system parameters to avoid undesirable negative effect on the transmission and generation systems.
iii. Electricity supply to customers in an economical and reliable manner while maintaining the statutory requirements of the system parameters.
iv. To plan and maintain reliable power systems because cost of interruptions and power outages can have severe economic impact on the business.

II. LITERATURE REVIEW

2.1 Extent of Past Works

According to [3], energy is the most fundamental and universal measure of all sorts of works performed by humans and nature. When most people hear the phrase energy, they immediately think of crude fuels and electrical power, which is not surprising given that it refers to the input into their bodies or into machinery. In the past, the primary purpose was to consume electricity since it was freely available and had the capability of performing activities; but, as time has passed, the emphasis has switched to the conservation of electricity rather than the consumption of electrical energy[3]. In the case of power system disturbances, under voltage, voltage dips, and power factor are the most common factors to consider, accounting for virtually all of them. An investigation into the flow of load is carried out in order to identify and pinpoint the source of the difficulties. Using the findings of these investigations, it is possible to reduce system disturbances by incorporating additional devices (such as capacitors) into the system [4,5].The distribution system is responsible for the vast majority of the total capacity of the electrical power system [6].Electric power distribution system is the final level of power supply system and the most noticeable to the end users [7]. When it comes to power outages in Nigeria, the frequency is extraordinarily high and shockingly high. Even though there are many parts of national life in which an interruption in power service should never occur, interruptions in power service that persist for many days are common and can occur anywhere in the country, including isolated areas [8]. Power quality is a key concern in industrialized countries, but in developing countries such as India, the load is growing at an alarming rate, and generation is failing to keep up with the amount of demand being met [9].Power quality is a measure upon which power supply variables – voltage, frequency and other waveform maintain statutory limit [10].

2.2 Load Flow Study in Power System

[11] says that load flow study is a numerical investigation of circuit parameters such as current, voltage, real, and reactive power flowing in a power system network under steady state conditions. [12] say that load flow study is a critical component of any electrical power system that is interconnected.[13]points out that a load flow study appears to be distinct from a conventional circuit analysis and that conventions and notations such as a single line diagram and the per unit system, are utilized in the load flow research. According to [14], power flow problems entail the estimation of bus voltages and line current flow inside a specific network carrying a particular loading schedule under specified conditions. The iterative method of assigning an estimated value to an unknown bus voltage and computing the new value for each bus voltage periodically until the change at each bus voltage is less than a defined minimum value,is required for the digital solution of the power flow problem.

2.3 Capacitor Bank

[15] sees a capacitor bank is a collection of capacitors that are connected together in order to improve the power factor of the system being monitored. When using a standard capacitor bank, the capacitors can be linked in either series or parallel configuration.[16] say that capacitor banks can be used in a distribution network to optimize the voltage profile of a feeder while simultaneously reducing power loss. It is vital, however, that capacitor banks be placed in the most advantageous location possible within the distribution network. Static capacitor banks in distribution systems improve power factors, reduce power loss, and improve the voltage profile of the system. It was determined that the capacitor bank needed to be located closer to the load center in order to reap the greatest benefit[17].

III. MATERIALS AND METHOD

3.1 Materials Used in the Analysis

The materials used are :

i. A single line diagram and data
ii. Step down transformers of ratings 1.5MVA and 5.0MVA
iii. Cable size and route length.
iv. Electrical Transient Analyzer Program (ETAP version 19.1) software environment.

3.2 Method Used in the Analysis

Newton Raphson load flow technique is employed in this work.

3.3 Data Collection

The data used in this research work are collected from the Notore Electrical Department

Table 3.1: Notore 11kV Distribution System Load data

LOC	Area Name	Trans. No	Trans. Rating	kW	KVAR	KVA
1	Ammonia	TR0131/0132	1.5MVA/11/0.44kV	1132	437	1214
2	Urea/Urea Gran./NPK	TR1321/1322	5.0MVA/11/3.3kV	3585	2921	4624
3	Urea	TR1331/1332	1.5MVA/11/0.44kV	1047	431	1132
4	NPK	TR1431/1432	1.5MVA/11/0.44kV	1195	672	1371
5	Utilities 2	TR2021/2022	5.0MVA/11/3.3kV	2439	1912	3099
6	Utilities 1	TR2031/2032	1.5MVA/11/0.44kV	817	258	857
7	Ammo. ClgTwr/Utility	TR2231/2232	1.5MVA/11/0.44kV	719	364	806
8	Workshop/Warehouse	TR2631/2632	1.5MVA/11/0.44kV	1342	594	1468
9	Bulk Storage MCC Bldg	TR2833/2834	1.5MVA/11/0.44kV	914	295	960
10	Bagging Bldg	TR2831/2832	1.5MVA/11/0.44kV	1211	551	1331
	Total Loads			**14401**	**8435**	**16862**

Source: Electrical Department, Notore Chemical Industry PLC

3.4 Description of Existing Notore Distribution Network

The existing Notore 11kV Distribution system consist of twenty (20) distribution transformers with their respective installed capacities and rated voltage. Power supply to the network is via Port Harcourt Electricity Utility which is currently not connected and the privately owned 2x25MW Gas Turbine Generators.

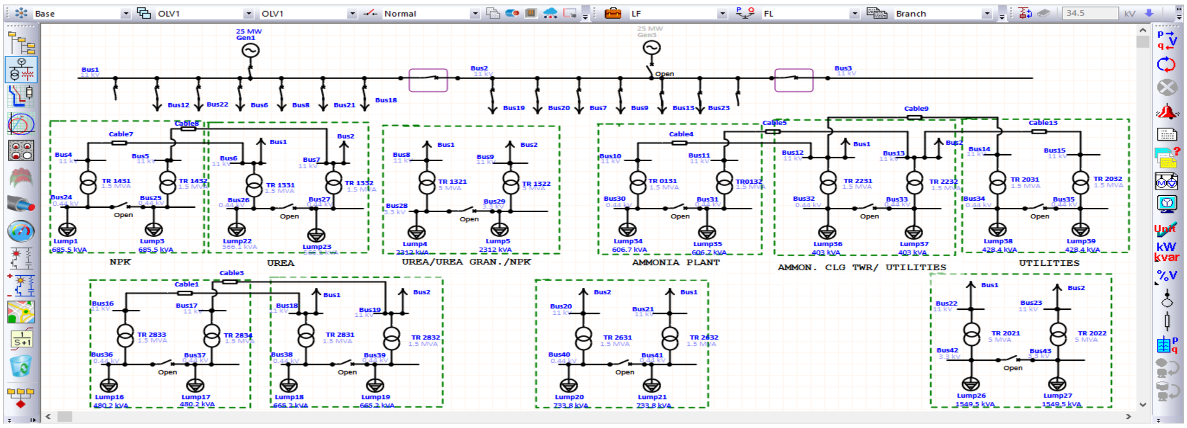

Figure 3.1: Single Line Diagram of Notore 11kV Distribution System
Source: Electrical Department, Notore Chemical Industry PLC

3.5 Load Determination

3.5.1 Current Determination (I_L)

The average load current (I_L) of the distribution transformer is giving by

$$I_L = \frac{I_R + I_Y + I_B + I_N}{3} \quad (3.1)$$

Where

I_R is current in the red phase

I_Y is current in yellow phase

I_B is current in the blue phase

I_N is current in neutral

3.5.2 Apparent Power Determination (KVA)

The load KVA of a distribution transformer is giving by

$$KVA_{Load} = \sqrt{3} \times I_L \times V_s \quad (3.2)$$

Where

I_L is average load current

Vs is the secondary voltage of the transformer

3.5.3 Real Power Determination (kW)

The load kW of a distribution transformer is giving by

$$KW = KVA_{Load} * PF \quad (3.3)$$

Where

KVA is load apparent power

PF is the power factor

3.6 Newton Raphson Load Flow Method

The apparent power injected at the *ith* node is

$$S_i = V_i I_i^* = P_i + jQ_i \quad (3.4)$$

$$I_i = \left(\frac{S_i}{V_i}\right)^* = \frac{P_i - jQ_i}{V_i^*} \quad (3.5)$$

$$I_i = \frac{P_i - jQ_i}{V_i^*} = \sum_{k=1}^{n} Y_{ik} V_k \quad (3.6)$$

$$P_i - jQ_i = V_i^* \left(\sum_{k=1}^{n} Y_{ik} V_k\right) \quad (3.7)$$

Let $V_i^* = V_i \angle - \delta_i, V_k = V_k \angle \delta_k$ and $Y_{ik} = Y_{ik} \angle \theta_{ik}$

$$P_i - jQ_i = V_i \left(\sum_{k=1}^{n} Y_{ik} V_k \angle \delta_k + \theta_{ik} - \delta_i\right) \quad (3.8)$$

$$P_i - jQ_i = \sum_{k=1}^{n} |Y_{ik}||V_i||V_k| \left[\cos(\delta_k + \theta_{ik} - \delta_i) + j \sin(\delta_k + \theta_{ik} - \delta_i)\right] \quad (3.9)$$

3.7. Determination of the Size of Capacitor Bank

The size of the Reactive Power the of capacitor bank required for compensation of the distribution network can be expressed as;

CkVAR = kW $(tan\theta_1 - tan\theta_2)$ (3.10)

Where,

Reactive Power of Capacitor Bank in kVAr = CkVAr

Existing power factor $(\text{Pf})_1 = \cos\theta_1$

Improved power factor $(\text{Pf})_2 = \cos\theta_2$

System frequency (f) = 50Hz

Existing power factor = 0.85 = $\cos\theta_1$

Desired power factor = 0.95 = $\cos\theta_2$

$$\text{Tan}\,\theta_1 = \text{Tan}[\cos^{-1} 0.85] = 0.62$$

$$\text{Tan}\,\theta_2 = \text{Tan}[\cos^{-1} 0.95] = 0.33$$

$$\text{Tan}\,\theta_1 - \text{Tan}\,\theta_2 = 0.62 - 0.33 = 0.29$$

Load power on Bus 28 (UREA/UREA GRAN/NPK) = 3585 kW

∴Reactive Power of capacitor bank = 3585 x 0.29 = 1039.6KVAr

Load power on Bus 40 (WORKSHOP/WAREHOUSE) = 1342kW

∴ Reactive Power of capacitor bank = 1342 x 0.29 = 389.2KVAr

Load power on Bus 42 (UTILITIES 2) = 2439kW

∴ Reactive Power of capacitor bank = 2439 x 0.29 = 707.3KVAr

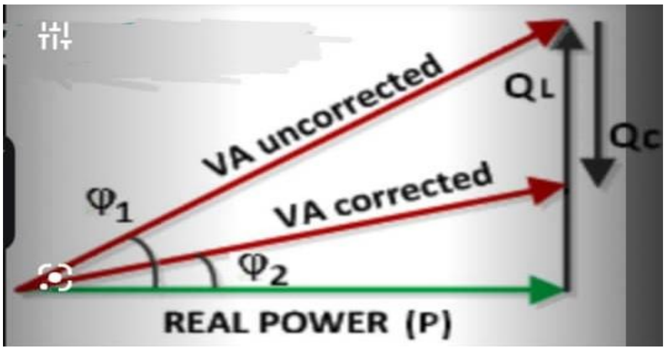

Plate 3.1: Shows the Phasor Diagram of the Reduced Power Angle

IV. RESULTS AND DISCUSSION

4.1. Pre-Upgrade Result

The figure below shows the existing Notore 11kV distribution system

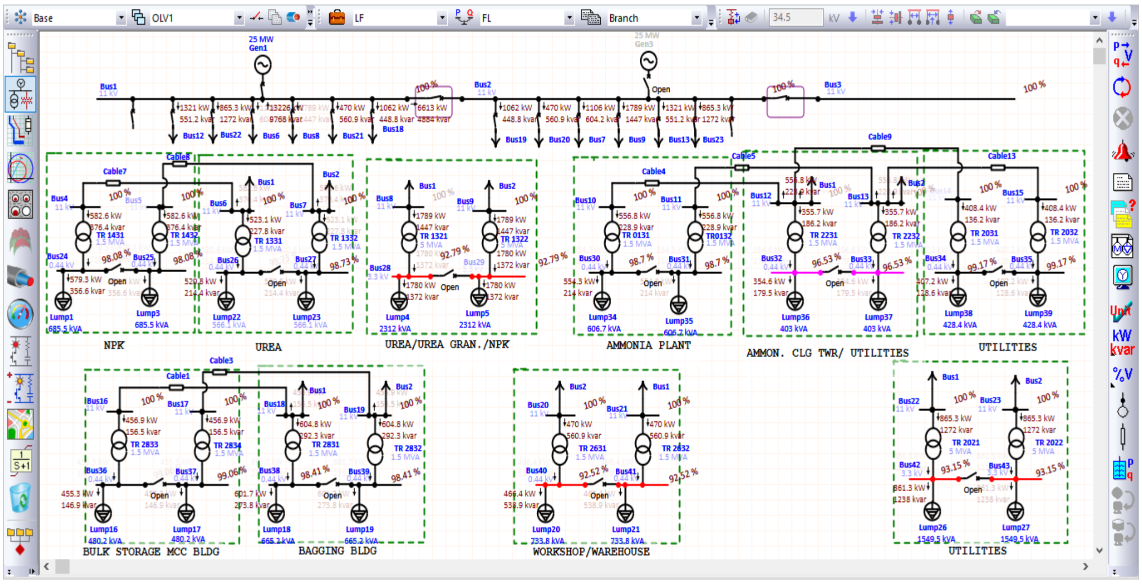

Figure 4.1: Existing Notore 11kV Distribution System

The Figure 4.1 shows the existing Notore 11Kv Distribution system consisting of twenty (20) distribution transformers with their respective installed capacities and rated voltage. A quick look at the buses in figure 4.1 shows that some buses indicated by colour code violated the statutory limit condition and requires compensation for the purpose of improving the network.

Table 4.1: Bus Voltage for Existing Network Condition

S/N	Area Name	Bus ID	Nominal Voltage (kV)	Operating Voltage (%)
1	NPK	Bus24	0.44	98.08
		Bus25	0.44	98.08
2	UREA	Bus26	0.44	98.73
		Bus27	0.44	98.73
3	UREA/UREA GRAD./NPK	Bus28	3.30	92.79
		Bus29	3.30	92.79
4	AMMONIA PLANT	Bus30	0.44	98.70
		Bus31	0.44	98.70
5	AMMONIA CLG TWR/UTILITIES	Bus32	0.44	96.53
		Bus33	0.44	96.53
6	UTILITIES 1	Bus34	0.44	99.17
		Bus35	0.44	99.17
7	BULK STORGARE	Bus36	0.44	99.06
		Bus37	0.44	99.06
8	BAGGING BLDG	Bus38	0.44	98.41
		Bus39	0.44	98.41
9	WORKSHOP/ WAREHOUSE	Bus40	0.44	92.52
		Bus41	0.44	92.52
10	UTILITIES 2	Bus42	3.30	93.15
		Bus43	3.30	93.15

Table 4.1 shows the nominal and operating voltage of the existing Notore 11Kv Distribution Network system when capacitor bank is not installed. A quick look at table 4.1 shows that Urea/Urea Grad./NPK (92.79%), Workshop/warehouse (92.52%) and Utilities 2 (93.15%) violated the voltage statutory limit condition.

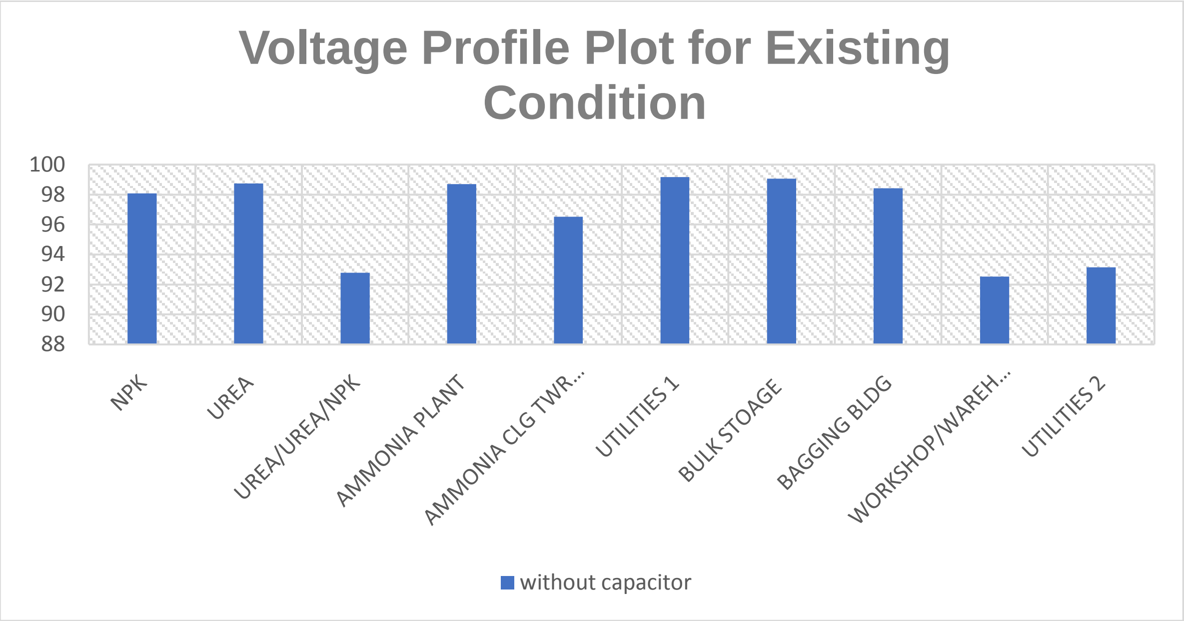

Figure 4.2 Voltage Profile of Existing Notore 11kV Distribution

Figure 4.2 shows voltage profile of the voltage profile of existing Notore 11kv distribution system when capacitor bank is not installed. A quick look at Figure 4.2 shows that Urea/Urea Grad./NPK (92.79%), Workshop/warehouse (92.52%) and Utilities 2 (93.15%) violated the voltage statutory limit condition.

4.2 Post-Upgrade Result Presentation

Figure 4.3 below is the improved Notore 11kV distribution system

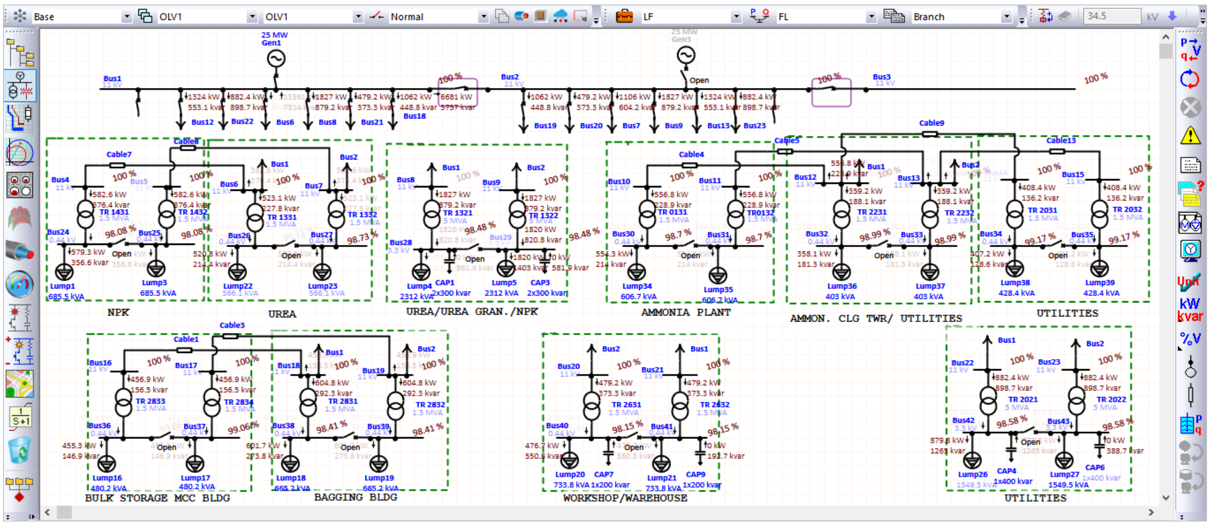

Fig. 4.3: Improved Notore 11kV Distribution System

Figure 4.3 shows the improved Notore 11kV Distribution system simulation when capacitor bank is installed. From Figure 4.3, no violation in bus voltage statutory limit condition occurred and the voltage profile of the marginally weak buses indicated in pink in Figure 4.1 above of the network, that are not directly compensated, has been improved.

Table 4.2: Bus Voltage for Improved Network Condition

S/N	Area Name	Bus ID	Nominal Voltage (kV)	Operating Voltage (%)	Percentage Improvement (%)
1	NPK	Bus24	0.44	98.08	0.00
		Bus25	0.44	98.08	0.00
2	UREA	Bus26	0.44	98.73	0.00
		Bus27	0.44	98.73	0.00
3	UREA/UREA GRAD./NPK	Bus28	3.30	98.48	6.13
		Bus29	3.30	98.48	6.13
4	AMMONIA PLANT	Bus30	0.44	98.70	0.00
		Bus31	0.44	98.70	0.00
5	AMMONIA CLG TWR/UTILITIES	Bus32	0.44	98.99	2.55
		Bus33	0.44	98.99	2.55
6	UTILITIES 1	Bus34	0.44	99.17	0.00
		Bus35	0.44	99.17	0.00
7	BULK STORGARE	Bus36	0.44	99.06	0.00
		Bus37	0.44	99.06	0.00
8	BAGGING BLDG	Bus38	0.44	98.41	0.00
		Bus39	0.44	98.41	0.00
9	WORKSHOP/ WAREHOUSE	Bus40	0.44	98.15	6.09
		Bus41	0.44	98.15	6.09
10	UTILITIES 2	Bus42	3.30	98.58	5.83
		Bus43	3.30	98.58	5.83

Table 4.2 shows the nominal and operating voltage and the percentage improvements on the existing Notore 11kV Distribution Network system when capacitor bank is installed on the critically weak buses. A quick look at table 4.2 shows no violation in bus voltage statutory limit condition of 0.95-1.01pu. Urea/Urea Grad./NPK (98.48%), Workshop/warehouse (98.15%) and Utilities 2 (98.58%) which shows that the capacitor bank impacted positively when added to the network.

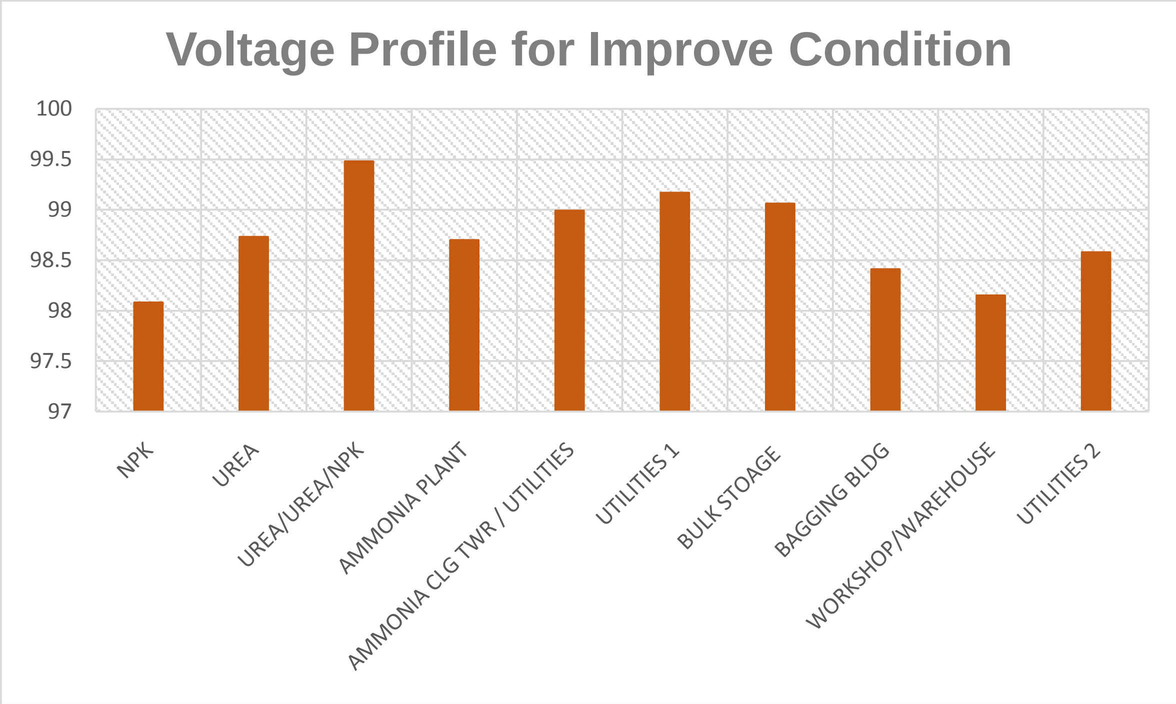

Figure 4.4: Voltage Profile of ImprovedNotore 11kV Distribution

Figure 4.4 shows voltage profile of existing Notore 11kV distribution system when capacitor bank is installed. A quick look at figure 4.4 Urea/Urea Grad./NPK (98.48%), Workshop/warehouse (98.15%) and Utilities 2 (98.58%) shows that the capacitor bank impacted positively when added to the network.

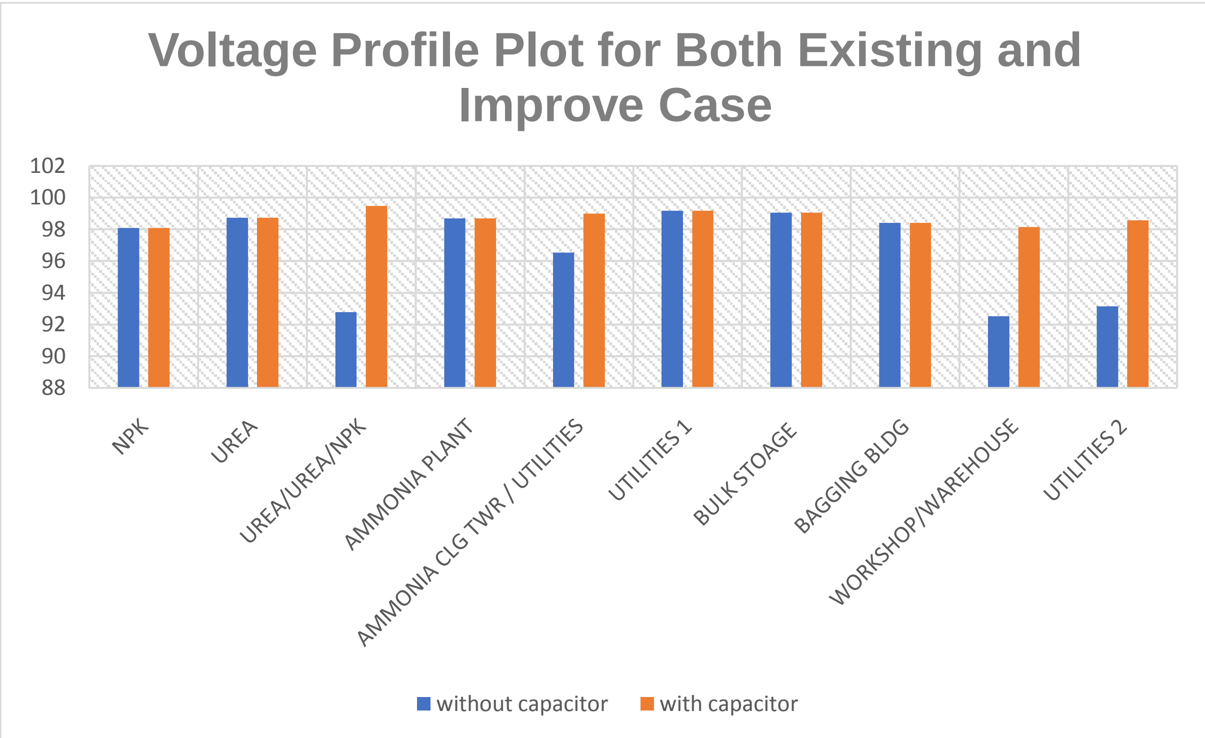

Fig. 4.5 Comparison Plot of Voltage Profile for both Existing and Improve Condition

Notore 11kV distribution network voltage profile graphs are depicted in Figure 4.5 for both the present and enhanced conditions. When there is no capacitor bank linked to the network, the network status is represented by the color blue on the screen. Similarly, when a capacitor is connected to the network, the better network condition is depicted by the use of brown coloration. A cursory glance at figure4.5 reveals that the voltage profile of the network greatly improved after a capacitor bank was added to the network.

V. CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

The present Notore 11kV distribution network, which consists of 20 distribution substations and is fueled by a 25MW gas turbine generator, was the subject of the study. In the Electrical Transient Analyzer Program (ETAP19.1) software, the network was modeled and tested. By applying the Newton-Raphson power flow analysis method, the existing and enhanced networks were both evaluated. As a starting point, buses that exceeded the 0.95-1.05p.u (95 percent - 105 percent) voltage regulatory limit were identified and adjusted appropriately with a capacitor bank in the basic scenario. As a result of the findings, it is concluded that the study is important in determining the optimal operating condition of the existing system, and that the installation of a static capacitor bank for reactive power compensation was found to be effective in improving the voltage profile of the weak buses and preventing system failure.

5.2 Recommendation

The following recommendations are highlighted to ensure effective power supply to Notore 11kV distribution system.

i. At Urea/Urea granulation/NPK bus a total of 1200kvar capacitor bank be installed, 2 units of 300kvar on each of the two load bus of urea/urea granulation /NPK bus.
ii. At Workshop/warehouse bus a total of 400kvar capacitor bank be installed, 1 unit of 200kvar on each of the two load buses.
iii. At Utilities 2 a total of 800Kvar capacitor bank be installed, 1 unit of 400Kvar on each of the two load buses.

REFERENCES

[1]. Braide, S. L., Oke I. Awochi&Idoniboyeobu, D. C., [2019] " Optimal Sizing of Distribution TransformerUsing Improved Consumer Load Forecasting" American Journal of Engineering Research, Vol. 8: Issue 4: pp.83-89.

[2]. Uwho, K. O., Idoniboyeobu, D. C., &Amadi, H.N., [2022] "Design and Simulation of 500kW Grid Connected PV System for Faculty of Engineering, Rivers State University UsingPvsyst Software" Iconic Research and Engineering Journals, Vol. 5: Issue 8: pp. 221-229.

[3]. Puneet, C., [2016]"Performance Analysis of 11kV Industrial Distribution Feeder with Calculation of Capacitor Bank" International Journal of Electronics, Electrical and Computational System, Vol. 5: Issue 9: pp. 16-33.

[4]. Push, R.,[2013] "Load Flow and Short Circuit Analysis of 400/220kV Substation" International Journal of Creative Research Thoughts, Vol.11: Issue 4: pp.14-20.

[5]. Anderson, M., & Fouad, A., [1994] "Power System Control and Stability" New York: IEEE Press,Vol.10 : Issue 9: pp.24-35.

[6]. Goran, A., [2008]" Modelling and Analysis of Electric Power Systems" Lecture 227-0526-00, ITET ETH, Zurich, Vol.11: Issue 21: pp. 34-42.

[7]. Iwuogu, E. I., Idoniboyeobu, D. C., Braide, S. L., &Uwho, K. O., [2022] "Optimal D-Statcom Placement for Loss Minimization in Distribution System Using Loss Sensitivity Technique" International Journal of Advances in Engineering and Management, Vol. 4 : Issue 5: pp.2029-2039.

[8]. Asaduzzaman, M.S., Muhit, M. S., & Khaled-Hossain, M.D., [2014]"Fault Analysis Electrical Protection of Distribution Transformers" Global Journal of Research in Engineering, Vol.14: Issue 3 :pp. 12-20.

[9]. Rohit, K., [2013] "Load Flow Analysis of 132 kV substation using ETAP Software" International Journal of Scientific Engineering Research, Vol.4: Issue2: pp.1-5.

[10]. Chikezie, O., Idoniboyeobu, D. C., Braide, S. L., &Uwho, K. O., " Enhancement of 11kV Distribution Network for Power Quality Improvement Using Artificial Neural Based DVR" Iconic Research and Engineering Journals, Vol. 5 : Issue 10 : pp. 102-111.

[11]. Stevenson, B. W.,[2018]"Electric Power Systems Basics" Houston: Wiley- Interscience.

[12]. Li H., Zhang. A., Shen X., & Xu, J., [2014] "A Load Flow Method for Weekly Meshed Distribution Networks Using Powers as Flow Variables "International Journal of Electrical Power & Energy for Energy System, Vol.22 : Issue 5: pp. 375-350.

[13]. Dharanmjit, Tanti D.K., [2012] "Load flow analysis on IEEE 30 bus systems "International Journal of Scientific and Research Publications, Vol. 2: Issue 11 : pp.1-6.

[14]. Ibe, A.O., [2002]. Power system analyusis. Enugu: Odus Press.

[15]. Chandra, A. and Agawarl, T.,[2014] "Capacitor Bank Designing for Power Factor Improvement "International Journal of Emerging Technology and Advanced Engineering, Vol. 4 : Issue 8 : pp. 235-239.

[16]. Reza, S., Azah, M. &Hussain, S., [2012]"HeuisticOptimization Techniques to Determine Optimal Capacitor" Department of Electrical and Systems Engineering University Kabagsaan Malaysia.

[17]. Aman, M.M., Jasmon, G.B., Bakar, A.H.A,&Karimi, M.,[2014]"Optimum Shunt Capacitor Placement in Distribution System: A Review and ComparativeStudy"*Renewable and Sustainable Energy Reviews*,Vol.30 : Issue C : pp. 429-439.

[18]. Srividya, V.,[2013] "Optimum Capacitor Placement in Radial DistributionSystem UsingDijkstraAlgorithmMethods "Enriching Power and Energy Development, Vol. 3 : Issue 1 : pp. 1-9.