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MANAGEMENT OF ELECTRICITY POWER SUPPLY IN DELTA AND EDO STATES OF NIGERIA: PROBLEMS AND PROSPECTS

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ABSTRACT

The objective of this paper is to examine the problems and prospects of electricity power supply in Delta and Edo States. To achieve this goal, a sample of 120 respondents was interviewed by the researcher and field data collectors. The data presentation tools were tables, simple bar charts, histogram, pie - chart and percentages. It was found out that poor funding, lack of maintenance culture, use of obsolete equipments, lack of spare parts and inadequate trained manpower constitutes the problems of the organization and no serious adequate plans have been put in place to address these problems. Based on the aforementioned, it was therefore recommended that PHCN's equipments should be upgraded, government should adequately fund the organization, and management should develop a vibrant maintenance culture and employ adequate and well trained staff.

KEYWORDS

Management, Electricity, Power, Supply and Nigeria.

INTRODUCTION

Generally, organizations exist to attain a specific goal or goals with some available resources at its disposal. The efficient and effective utilization of its resources to produce goods and services goes a long way to demonstrate the management's ability to accomplish organizational goals (Jones, 2003). However, the inability of an organization to judiciously manage its resources effectively means it has failed as an entity and cannot meet the challenge of providing goods and services to its consumers.

In recent years, electricity "Supply has become very significant owing to the seeming indispensable role played by electricity in every aspect of our daily lives. Absence of electricity for long periods, causes discomfort and hampers productivity. It is also a known fact that electricity consumption has become a parameter by which the standard of living as well as the level of industrialization of nations is measured (Mahammed, 2005). The federal government of Nigeria in 1998 mandated the Power Holding Company of Nigeria (PHCN) to generate, transmit and distribution power to Nigerians. The question now, is has the organization been effective in carrying out its mandate of generating power for the consumers? If not, what are the problems militating against its inability to successfully carry out this mandate and how can these problems be addressed? This is the task this study hopes to investigate. To achieve this objective, the paper has therefore been sectionalized into five parts which include the introduction which has already been discussed.

LITERATURE REVIEW

PHCN IN PERSPECTIVE

The first electric power plant built in Nigeria was located in Lagos. It was built in 1898 and was managed by Public Works Department (PWD). NEPA, otherwise known as Power Holding Company of Nigeria (PHCN) in its present form came into being in 1972, with a mandate to *develop* and maintain an efficient, co - ordinated and reliable power supply in the country. In 1973, only eight (8) of the present 36 States in Nigeria were directly connected to the National Grid. Today all states but one are fed from the National (Hamzat, 2005). PHCN'S system consist of ten (10) power stations (7 Thermal and 3 Hydro), with a total installed capacity of about 6000 Megawatts (6000MW) interconnected by net work of 500 kilometers (KM) of 330 Kilovolt (330KV) and 6000 KM of 132KV transmission lines. Transmission of bulk power to major load centers is by means of 24 numbers 330KV and 92 numbers 132KV substations from which the voltage is further transformed to 33KV, 11 KV, 6.6KV 3.3KV for distribution at 240 volts and 415 volts. (Hamzat, 2005).

In March 2000, the president of the federal Republic of Nigeria took charge of affairs of PHCN and set up a nine (9) Man Technical Board with full Executive powers. The mandate of the Board is to ensure uninterrupted power supply by December 31, 2001. The board reports directly to the President and also has additional mandate to generate 4000MW by December 31, 2001. Part of the Board's mandate is to restructure PHCN to meet present day realities and to encourage private sector participation in the industry. In line with this mandate, the Board has proposed the break - up of the utility into its functional parts of Generation, Transmission and Distribution and the eventual introduction of separate single buyer to perform centralized bulk power trading. By this process, all elements will be subject to competition, while maintaining the same ownership. The operation of each of these elements will be put into the hands of separate management structures. These de - segregated entities while being managed independently may not be legally separated companies. This structural model is transitory and loosely patterned after expected privatization model (Mahammed, 2005).

POWER STATIONS

A good plant mix to provide for contingencies cannot be overemphasized for stability and security of power supply. Nigeria is blessed with abundant energy resources for the production of electricity. What is required is the investment to harness these resources to establish a strong and reliable power supply system. PHCN operates the following power stations.

Table 1 shows the power stations and their source of fuel.

TABLE 1: POWER STATION AND THEIR SOURCE OF FUEL

Hydro	Steam	Gas	Ago
Kainji	Egbin	Sape/Eljora	
Jebba	Sapele	Afan	
Shiroro		Delta	

Source: From PHCN Review, 2009

Kainji, Jebba and Shiroro power stations use water for the generation of Electricity, Egbin and Sapele are using steam while Sapele, Afam and Delta power stations are using gas. Ijora power station is run on diesel oil. Sapele has two stations; one runs on gas while the other uses steam for electricity generator.

Table 2 shows the installed, available and written - off capacities of the stations.

TABLE 2: INSTALLED AND WRITTEN - OFF CAPACITIES OF THE STATION

	Installed Capacity (MW)	Available Capacity (MW)	Written off Capacity (MW)
Thermal	3976	1538	376
Hydro	1900	1550	100
Total	5876	3088	476

Source: PHCN Review (2009)

In table 2, we can see that the total installed capacity of both the hydro and steam stations is 5876 mega watts (MW). The available generation capacity is 3088 MW, while the capacity of written off or scrapped units is 476 MW.

The effective installed capacity is 5400 MW (5876 - 476 = 5400) made up of plants which are over 15 years on the average and require rehabilitation and repairs to sustain adequate and reliable generation capacity. Currently, 39% of annual energy is generated by hydro while 61 % is from thermal (PHCN, 2005).

FUTURE PROSPECTS FOR POWER GENERATION

In order to meet the social, economic and technological demands of the 22nd century, it is imperative to boost electricity consumption in Nigeria.

Table 3 below compares the present power supply situation and the projections of the vision 2010 committee and additional power stations are to be built to meet the projected power demands of Nigerians.

TABLE 3: POWER SUPPLY PROJECTIONS

Year	Per Capacity Consumption (KWHR)	Installed Capacity (MW)	Peak Demand (MW)
1998	116	5400	2470
2010	1100	25090	19307

Source: PHCN Review (2009)

TRANSMISSION STATION

In the area of transmission of generated electricity, Omoigui and Komolafe (2000) have conducted extensive studies titled, 'Focus on the evaluation of electricity demand and availability of generating and transmission facilities in Nigeria'. The study discovered that PHCN do not transmit enough generated power supply to the Nigerian consumers.

Presently, there are twenty - four (24) 330KV transformer/switching substations and ninety - two (92) 132KV transformer switching substation in the country. These substations are located over the entire 923768 square kilometers (krrr²) area that makes up Nigeria to supply the power requirements of each load center. In addition there are about thirty - nine (39) 330KV overhead transmission lines stretching a total of about 4, 970 kilometers to link the twenty four (24) 330KV substations. There are one hundred and nine (109) 132KV overhead transmission lines stretching total of about 4841 kilometers to link the ninety two (92) 132KV substations in various parts of the country (Omoigui and Komolafe, 2000). Primary distribution networks emanate from these substations. The sub - transmission scheme in the country is mostly radial, providing a single power flow route to consumers. Thus while commenting on the impact of transmission mode on electricity supply, Omoigui: and Komolafe posited that: "owing to the predominantly radial configuration of transmission lines, any slight changes in the operating point of any of the major plants can initiate disturbances which may lead to system collapse" (Omoigui and Komolafe: 2000:233). Their premise is based on the knowledge and acceptance of fact that due to the enormous size of the country the transmission lines are several kilometers long and sometimes stretch over swamp or wide rivers and thick forests, all of which constitute hidden and real hazards that can interrupt the smooth transmission of electricity to the consumers. Also concentration of industries in the country is predominately one - sided thus resulting in overstressing of the lines and equipments of PHCN on one end while the other end experiences less stress. This results in dynamically unstable equilibrium power system network.

DISTRIBUTION NETWORK

The distribution network has experienced very rapid growth especially with progressive rural electrification policy of the Federal Government. Most urban centers are developing very fast and power demand is on the increase. In terms of efficient and adequate supply however, numerous problems hinder the performance of PHCN. This aspect of the discourse is the core issue around which this research study resolves. Caven (1998), opined that residential areas in some cities have suddenly been transformed into commercial centers thereby overloading the existing power supply facilities. The high cost of distribution materials has limited the ability of the Authority to cope as most urban planning and developments are carried out without prior information to the Authority to plan and provide the requisite electricity supply information.

CONSTRAINTS OF PHCN

Caven and some other authors have carried out detailed studies of the problems that militated against the smooth supply of PHCN. Some identified points include:-

1. Delayed rehabilitation of plants and power supply equipment
2. Lack of spare parts; and
3. Absolute equipment, (Caven, 1998).

Consequently, enormous amount of foreign exchange is required to rehabilitate and repair plants as well as provide running spares for scheduled maintenance. Rising inflation and scarcity of foreign exchange (largely as a result of stiff exchange policy) constituted nightmare to PHCN (Caven, 1998).

TABLE 4: INVESTMENT/EXPENDITURE PROFILE

S/No	Material	Present Cost N	Cost 6 year Ago N
1.	Concrete Pole (28ft)	5,500.00	1000.00
2.	30Ampere 11/0.415KVXlpe cable	1,002,017.00	388,000.00
3.	A cable drum of 150mm ²	280,00.00	31,000.0
4	200KVA33/0.415KV transformer	1,024,147.00	110,000.00

Table 4 above shows a clear picture of the inflationary trend in the country as it affects electricity supply materials. While addressing these problems, Shomolu (1996) made the following succinct observation:

"A power system needs to pay attention to the life expectancy of its component plant and major accessories. In the case of PHCN, virtually every plant it has now, was ordered and built between 1965 and 1990. The concern here is that the bulk of the equipment may also need to be replaced within a few years of one another and this may pose fund problems". (Shomolu 1996:160).

Shomolu goes further to list the various factors that affects the life expectancy of various equipment used in power systems. Some of these factors are:

1. The physical environment;
2. The load to which it is subjected;
3. The frequency and duration of faults to which it is subjected;

4. The quality and competence of maintenance personnel;
5. The availability of spare parts;
6. The manufacturing standard and its specific rating; and ingenuity and resourcefulness of the maintenance personnel (Shomolu, 1994).

Thus a piece of equipment may have varied life span depending on the interplay and manipulation of the above factors. In a bid to further give details of the points raised here, Shomolu (1994) outlined the life expectancy period of some power supply equipment. Table 5 below describes the life expectancy period of some equipment.

TABLE 5: LIFE EXPECTANCY TABLE

S/No	Equipment	Life Expectancy
1.	Power transformer	50
2.	Grounding transformer	25
3.	Distribution transformer	25
4.	Circuit breakers	25
5.	Transformer line tower	50
6.	Current transformer (CTS)	30
7.	Potential transformer (PTS)	30
8.	Capacitor banks	10
9.	Protective relays	20
10.	System control and Data Acquisition (SCADA)	10

Table 5 shows the life expectancy of various electric power supply equipment. It can be seen that transformers and transmission line towers have a life expectancy of 50 years while capacitor banks and SCADA have 10 years life.

The inadequate and erratic gas supply to the thermal stations is a second major constraint that hampers electricity generation with a resultant effect of massive load shedding on the electricity users. The thermal power stations located in Afam, Delta and Sapele are most severally affected by this problem, and they are closest to the natural resources of gas in Nigeria. At Delta power station the generation capacity fluctuates from 150MW to 350MW because of the gas supply limitation whereas the plant availability exceeds 450MW on the average (Caven, 1998). In a related development, it is pertinent to mention that the availability of the hydro plants has been good but the constraints in hydro power generation mainly concerns the water in the reservoirs which is seasonal and depends on natural rainfall. Over - use of the hydro plants to meet the National Power demand as a result of the short fall in generation from thermal stations, usually results in the depletion of the hydro reservoirs.

A third major issue in the aspect of supply of electricity is that of transmission and distribution. This aspect plays a vital role, as it is the one that directly impacts on the individual consumers of electricity. A lot of expansion of the supply has been carried out but this has not been matched by corresponding expansion of transmission and distribution network. The result of this has been the occurrence of multiple overloaded subsystems. The planned transmission and distribution network expansion projects are just being executed by the technical board appointed by the President. Furthermore the 330KV and 132KV transmission lines in the National grid are mostly radial and very long. Consequently, this results in a situation which Caven described thus: "voltage Control and security of the power supply become problematic during faults or system disturbances" (Caven: 1998:41).

The fourth major hindrance to the supply of electricity has been the problem of overloaded power transformers in the grid substations and 80% of which are overloaded. This results in frequent power outages, low current output and consistent resources to load shedding. Other general constraints affecting system operation and electricity supply are lack of effective communication systems. The activities of vandals or unpatriotic acts of saboteurs who vandalize power supply facilities give PHCN a lot of concern. Also the problem of weather which manifests in the form of harmattan dust that clog or block the air intake filters of gas turbines and the inadequacy of staff welfare and development scheme put in place by the authority also adversely affect power supply.

METHODOLOGY, FINDINGS AND ANALYSIS OF STUDY

The methodology adopted for this study shall now be discussed. It will be followed by findings and analysis of data, while conclusion and recommendations will end the paper.

METHODOLOGY

The research design chosen in this study is a survey in which the researcher did not have control of the independent variables affecting electricity supply in Nigeria because they have already occurred and they could not be manipulated by the researcher. A sample of 120 respondents were personally interviewed by the researcher and assisted by field data collectors. The data presentation tools are tables, simple bar, charts, histogram and pie chart. The analysis tools are percentages, theoretical analysis and the chi - squared test for testing the three hypotheses.

RESULTS AND ANALYSIS OF FINDINGS

In this section, the results and analysis of the discussed. The data is to be presented by means of tables and pie chart to make them amenable for further analysis. According to (Mills and other 1996) analysis is the act of noting relationships of a variable with similar attributes and also dividing the units into their parts.

Yomere and Agbonifoh (1999) have observed that the main aim of any research undertaking is to characterize and describe the population by summarizing the data obtained from the samples studied. Data becomes more meaningful and useful after it has been analysed.

Table 6 below shows the summary of the personal data of the 120 respondents

TABLE 6: THE SUMMARY OF THE PERSONAL DATA OF THE 120 RESPONDENTS

1SEX	FREQUENCY	
Male	90	
Female	30	
Total	120	
2Married Status	Frequency	
Married	68	
Single	40	
Divorced	5	
Separated	7	
Total	120	
3Age	Frequency	
Less than 20 yrs	15	
21 - 30 years	20	
31 - 40 years	30	
41 - 50 years	40	
51 -60 years	10	
Above 60 years	5	
Total	120	
4Highest Education Qualification		Degree subtended
Senior Secondary Certificate (SSCE/GCE	20	60
Royal Society of Art (RSA)	15	45
Trade, Certificate	5	15
N. C. E.	10	30
Diploma	25	75
HND	13	39
First Degree	10	30
2 nd Degree	15	45
M. I. E. E.	5	15
	2	6
Total	120	360

Source: Author's Fieldwork, 2008

From table 6 above, it is shown that out of the 120 respondents, 90 are males while 30 of them are females. For the marital status of the 120 respondents there are married, single, divorced and separated, have frequencies of 68, 40, 5 and 7 respectively. For the ages of the 120 respondents they are; less than 20 years i.e 21 - 30 years, 31 - 40 years, 41 - 50 years and 51 - 60 years with frequencies of 15,20,30,40,10 and 5 respectively. For the highest educational qualifications, there are SSCE, SSCE/GCE, RSA, Trade certificate, NCE, Diploma, HND, First Degree, Second Degree and MIE with frequencies of 20, 15, 5, 10, 25, 13, 10, 15,5 and 2 respectively.

FIGURE 1: THE PIE CHART OF THE DATA ON THE HIGHEST EDUCATIONAL QUALIFICATIONS OF THE 120 RESPONDENTS

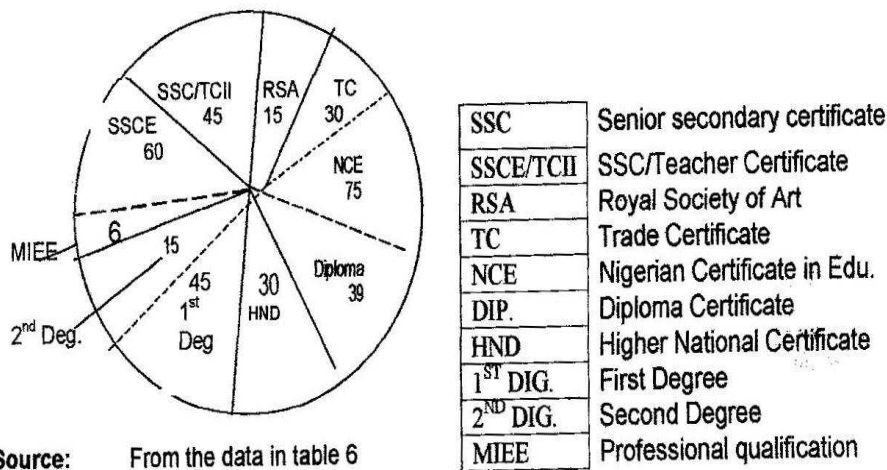


Figure 1 above, shows that the qualifications are Senior Secondary Certificate (SSC), SSCE/TCII, RSA, Trade Certificate, NCE, Diploma, HND, First Degree, Second Degree and Professional qualification (MIEE), and they are represented in their various degrees as follows: 60°, 45°, 15°, 30°, 75°, 39°, 30°, 45°, 15°, 6° respectively.

PERCENTAGE ANALYSIS

Table 7 below shows the percentage analysis of the responses to the Yes or No question.

TABLE 7: THE PERCENTAGE ANALYSIS OF THE YES OR NO QUESTIONS

S/	Qualification	Yes in No.	%	No. in Number	%	Total in No %	Total In %
1.	Can you say that electric supply in your area is effective	30	25	90	75	120	100
2.	Can you say that absence of adequate maintenance culture can cause (1) above?	95	97.17	25	20.83	120	100
3.	Do you think that inadequate funding could cause question (1)	105	87.5	15	12.5	120	100
4.	Is there prompt replacement of defective power supply facility in your areas?	40	33.33	80	66.67	120	100
5.	Can you say that non reinforcement of power supply facilities for frequent power outage	80	66.67	40	33.34	120	100
6.	Can you say that unemployment is high in your area?	70	58.33	50	41.67	120	100
7.	Can you say that high rate of unemployment is due to ineffective power supply?	50	41.67	70	58.33	120	100
8.	Can you say that communication system in your area is effective	40	33.33	80	66.07	120	100
9.	Do you think constant power failure affects development?	90	75	30	25	120	100
10.	Do you believe that frequent power outages adversely affect small scale industries.	75	62.5	45	37.5	120	100
11.	Do you believe that obsolete equipment contributes to power interruptions	60	50	60	50	120	100

Source: Author's Fieldwork, 2005.

Table 7 above shows the responses to the "yes" or "No" questions in absolute numbers and in percentage of the total. The 120 respondents are asked whether they could say that electric supply in their areas was effective and 30 others said "Yes" while 90 making 75% said "No". They were asked whether they could say that the absence of adequate maintenance culture could be responsible for the ineffectiveness of power supply and 95 out of the 120 making 79.17% said "yes" while 25 of which make up 20.83 said "No". The respondents were asked whether they thought inadequate funding could cause the ineffectiveness and 105 out of the 120 which make up 87.5% said "yes" while 15 made up of 12.5% said "no". The 120 respondents were asked whether there was prompt replacement of power supply facility in their area and 40 of them which make up 33.33% said "yes" while 80 others of 66.76% said "no".

The respondents were asked whether they could say that non reinforcement of power supply facility were responsible for frequent power outage and 80 of them making 66.67 said "yes" while 40 of them said "no". They are asked whether they could say that unemployment was high in their area and 70 of respondents made up of 58.33% said "yes" while 50 others making 41.67% said "no".

They were also asked whether the high rate of unemployment was due to the ineffectiveness of power supply and 50 of the respondents making 41.67% of them said "Yes" while 70 of them making 58.33% of them said "No". The 120 respondents were asked whether they could say that the communication system in their area was effective and 40 of them making 33.33% said "Yes" while 80 others making 66.67% said "No".

The 120 respondents were asked whether they thought that constant power failure affected development and 90 of them which constitutes 75% said "Yes" while 30 others which make up 25% said "No".

The respondents were asked whether they believed that frequent power outages adversely affected small scale industries and 75% of them which make up 62.5% said "Yes" while 75 others which constitutes 37.5% said "No".

Lastly, the respondents were asked whether they believed that obsolete equipment contributed to power interruptions and 60 of the respondents which constitute 50% said "Yes" while the remaining 50% of the respondents said "No".

CONCLUSION AND RECOMMENDATIONS

This study examined the problems and prospects of electricity supply in Nigeria with Delta and Edo States in focus. It was observed that PHCN's performance is constrained with a lot of problems which include lack of spare parts, obsolete equipments, poor maintenance culture, poor funding and Edo States is very bright if the problems identified earlier are fully addressed.

In view of the above, the following recommendations will be advanced:

- PHCN'S equipments should be upgraded to be able to meet up with the demands of its numerous customers for better service.
- The Federal government should pump more funds into PHCN to enable them buy these equipments. Although the federal government has been doing something in this direction, but they should do more.
- PHCN'S management should develop a maintenance culture whereby they check on their equipments more regularly rather than waiting for the equipments to finally breakdown before they find a solution.
- Lastly, PHCN'S management is advised to employ and train more staff in order to be able to deal with the challenge of providing quality service to its numerous customers.

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