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Assessment of Nigeria's Power Situation and the Way Forward

Israel Agwu Etu[1], Enesi Abdulrahaman Ahmed[2] and Kufre Esenowo Jack[3]
Department of Electrical/Electronic Engineering Technology, Akanu Ibiam Federal Polytechnic Unwana, PMB 1007 Afikpo, Ebonyi State, Nigeria

Abstract: One of the biggest threats to development in Nigeria is inadequate and erratic power supply. Any nation wishing to develop must increase its generated power in proportion to its population growth. For the so-called vision 20: 2020 to be attainable, Nigeria needs to register a take-off power generation status of 10,000 Mega Watts (that is, 10,000MW). Unfortunately, Nigeria's present power generation situation is a far cry from this, considering that it is not generating up to 4,000MW yet, with only about 40 percent of the entire population having access to public power supply. This paper takes a look at the factors militating against the realization of adequate and steady power supply in the country, the abysmal efforts being made from time to time by the relevant quarters to cub this menace and the degree of adversity faced by citizens as a result of the problem. It suggests possible ways out of the doldrums; and it is the wish of the paper that the sooner the recommendations are expeditiously implemented, the sooner Nigeria would be on the path leading to industrial development because no nations develops industrially without adequate and constant power supply.

Keywords: Nigeria, Power, Power Sector, PHCN

Introduction

Unstable electric power supply is no longer a new experience to Nigerians. It is now a customary thing. Nigerians have become so used to it that if there is continuous power supply for a consecutive number of hours, people would become afraid that by the time the power goes off, it may take days, weeks or even months to restore it.

The power problem of Nigeria is a hydra-headed one, manifesting itself in two main ways viz,

- Insufficient power
- Incessant power outage

Okoronkwo and Nwangwu (2006) described the power situation of this country as rather disappointing, considering the huge investments in the power sector by the Federal Government. They added that the consequence is decrease in economic activities and social comfort.

The remote cause of insufficient power generation is corruption in high places while incessant power outage is basically caused by system failure as a result of the following reasons adduced by Anyaehie (2011):

- Scarcity of relevant manpower for adequate maintenance and general consumer indiscipline
- Lack of essential spare parts for maintenance
- Absence of local manufacturing capabilities
- Lack of systematic studies of distribution networks to reduce extra-ordinarily high losses that accompany haphazard system expansion

Furthermore, Okoronkwo and Nwangwu (2006) also adduced the following reasons:

- Aged equipment
- Lack of quick response by fault clearing crew
- Overloading of equipment
- Strong and high wind acting on long lines
- Lack of ring main distribution system, hence no redundancy due to the use of only radial lines
- Activities of vandals

Both low power and unstable power are unhealthy for national growth and so need to be overcome. There is no gainsaying the fact that electric power is the vehicle on which every other sector of the nation rides to get to their destination (Anyaehie, 2011). It is no longer how much money a country controls, but how much electrical power it provides its citizens.

This paper advocates a sincere political will, on the part of our leaders, to combat the perennial power problem of this country, believing that it will serve as a sure springboard to her development.

History of power Generation in Nigeria

According to Obadote (2009) the generation of electricity in Nigeria began more than a century ago; precisely in 1896 when it was first generated in Lagos, which is fifteen years after its introduction in England.

In order to increase its production, various bodies at various times have been set up to manage and/or regulate the activities of power generation.

In 1950, Electricity Corporation of Nigeria (ECN) was established by an Act of Parliament to serve as a central body in charge of electricity supply and development. There were some other bodies like Native Authorities and Nigeria Electricity Supply Company (NESCO) which were only licensed to produce electricity in certain parts of the country (Okoro and Chikuni, 2007).

In 1962, by an Act of Parliament, another body known as Niger Dam Authority (NDA) was established. The Authority had the responsibility to generate electricity using the water resource of River Niger and any other River by construction and maintenance of dams (Sambo, 2008). Also included in the Authority's responsibilities was to promote navigation and fish brine and irrigation. Electricity Corporation of Nigeria bought electricity produced by Niger Dam Authority for distribution and sales at utility voltage. For the effective use of available resource for supply of electricity in the country and also to put the production and distribution of electricity in one body ECN and NDA were merged in April 1972 and known as National Electric Power Authority (NEPA).

As at inception in 1896, Nigeria was generating 60KW of electricity which was more than the peak load then. As at 1999, NEPA had an installed capacity of 5600MW of which only 1750MW was available out of the installed capacity, as against the required peak demand of 6000MW. This was as a result of poor investment in power sector infrastructure (Okoro and Chikuni, 2007). Even though the required peak load could not be installed, the installed capacity was not available as a result of lack of maintenance; in fact many of the generating units went off completely.

With the aim of meeting the needs and yearnings of the populace, the Nigerian government embarked on power sector reform. The reform programme led to unbundling of NEPA into seven generating stations, eleven distribution firms and one transmission company (Obadote, 2009). This led to the renaming of NEPA as Power Holding Company of Nigeria (PHCN). All these attempts aimed at encouraging private sector participation. The reform process which started in 2000 has since taken effect in 2004. In order to checkmate the services of Power Holding Company of Nigeria (PHCN), the Nigerian Electricity Regulatory Commission (NERC) was established in 2005 (Sambo, 2008). NERC also has the responsibility of issuing license and regulating the tariffs of expected private investors. Since then, many private investors have indicated interest in taking part in Nigeria Electricity Supply and some have gotten the license but full privatization is yet to commence.

Power Situation So Far

According to Nkwopara et al (2009) of Vanguard Newspaper, the Chairman of Manufacturers Association of Nigeria (MAN), Imo, Abia Branch, Dr Frank S. U. Jacobs, disclosed that an estimated 60 million Nigerians now own power generating sets for their electricity. He added that the same number of people spend a staggering ₦1.56 trillion ($13.35 billion) to fuel them annually. Moreover, he recalled with grief that the Senior Private Sector Specialist at the World Bank, Mr Steven Dimitryer, noted that Nigeria experienced the worst electrical crisis among its contemporaries which underscores the nightmarish generation, distribution and supply in the country. Dr Jacobs concluded by saying that all types of firms in Nigeria experience power outages and 85 percent of them own generators as alternative source of power generation and no country can become industrialized with ordinary standby electric generator. In June 2008, President, Umaru Musa Yar'Adua's Administration swung into a power plan. In that plan, the National Economic Council approved the release of ₦1.2 trillion ($10.24 billion) from the excess crude account. Out of this amount, ₦628.29 billion was to be invested in power and state of emergency was to be declared on the power sector. Furthermore, a committee was set up headed by the then Vice President, Goodluck Jonathan. Other members were Governors Olusegun Agagu (Ondo), Liyel Imoke (Cross River) and Danjuma Goje (Gombe). The Federal Government was to fund the Zungeru and the Mambila hydro plants with the projection of generating 6000 MW by the end of 2009, and 10,000 MW by 2011.

It is unfortunate that by the end of 2009, power generation was still below 4000MW as against the 6000MW, and by 2011 and until now, the situation rather grows worse sometimes, as against the estimated 10,000MW. The big question here is, how about the money that was mapped out and the committee that was set up to manage it?

According to vision 20:2020 draft (2010), power generation capacity as at year 2000 was 1500MW. This was due mainly to lack of investment in maintenance and expansion programmes on existing power plants. By December 2009 it increased to about 3700MW but actual generation was frequently constrained to below 2100MW as a result of inadequate gas supply and low water levels. Since then, power generation has been fluctuating between 3000MW and about 4000MW. Of this amount, gas-fired plants contribute about 64 percent while hydro plants contribute about 31 percent.

So far, only about 40 percent of Nigerians have access to electricity supply. This percentage translates to 64 million, out of the 160 million persons in Nigeria. This low percentage of coverage is due to inadequate transmission and distribution networks. The Federal Government of Nigeria projected to generate, 35,000MW of electricity by 2020, yet power projects in the country are moving at snail speed.

Meanwhile most of the power stations in the country do not generate at their installed capacities. The table below shows the power stations in Nigeria with their installed capacities.

Table 1. Power Stations in Nigeria (Source: Vision 20:2020 draft)

Power Station	Type	Capacity (MW)	Year Completed
Kainji	Hydro	470	1968
Jebba	Hydro	482	1985
Shiroro	Hydro	450	1990
Egbin	Thermal (Gas)	1100	1986
Sapele	Thermal (Gas)	450	1981
Delta	Thermal (Gas)	300	1966
Afam	Thermal (Gas)	420	1965
Ijora	Thermal (Gas)	60	1976
Geregu	Thermal (Gas)	414	2006

Table 2. National Integrated Power Projects (NIPPs). (Source: Vision 20:2020 draft)

NIPP	Projected Output (MW)
Calabar	562.5
Egbema	337.5
Ihovbor	450.5
Gbarain	252.0
Omoku	225.0
Alaoji	960.0
Papalanto	675.0
Omotosho	451.0

Furthermore, the brief analysis below shows how much Nigeria lags in access, quality and availability of public electricity supply, according to Obioma (2010).

- South Africa has 40,000MW for a population of 50 million people
- Brazil has 100,000MW for a population of 192 million people
- The US has 700,000MW for a population of 308 million people
- Nigeria has about 3450MW (out of a total installed capacity of 5200MW) for a population of about 160 million people; can only supply peak power of 3700MW out of a peak load requirement of 5103MW and cannot supply power nation-wide for 24 consecutive hours.

Power Failure Rate in Some Parts of the Country

A look at the reliability of the network of Power Holding Company of Nigeria (PHCN) in some areas of the country shows that the failure rate of electric power in the country is still abysmally high. Okoronkwo and Nsude (2006) assessed the failure rate of Abakaliki District in Ebonyi State. Their study covered a period of three years – from 2001 to 2003. Out of the three fault data tables they got from PHCN Abakaliki District, below is that of year 2003.

Table 3. Summary of Fault Data for Abakaliki Network in 2003 (Source: PHCN Abakaliki District)

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
1	2	2	7	2	1	3	-	3	3	10	3	2
2	9	3	9	3	4	3	-	3	3	7	5	4
3	3	1	7	3	2	4	-	4	3	3	1	4
4	3	5	1	1	3	2	-	7	4	7	6	2
5	2	3	1	5	1	7	-	1	2	1	7	5
6	2	1	5	1	5	2	-	4	5	8	5	1
7	5	1	6	5	1	6	-	4	1	3	5	3
8	2	4	3	3	6	3	-	1	7	7	4	2

9	2	2	2	2	5	4	-	3	4	1	3	2
10	1	5	4	6	3	3	-	2	2	4	3	5
11	1	6	5	6	3	3	-	2	2	4	3	5
12	7	11	3	1	3	9	-	3	5	5	4	7
13	2	1	2	8	1	4	-	1	7	6	4	4
14	0	5	6	1	4	5	-	3	5	3	7	2
15	5	2	3	1	3	4	-	1	3	4	2	2
16	1	2	2	1	5	7	-	4	6	3	1	5
17	8	5	1	2	4	10	-	1	6	1	2	1
18	2	1	6	4	6	2	-	3	2	2	2	5
19	1	8	1	7	4	4	-	0	4	5	4	3
20	1	3	4	1	2	2	-	3	7	1	5	1
21	2	2	1	3	5	3	-	1	3	5	2	2
22	5	5	5	4	4	8	-	4	2	4	3	5
23	4	3	4	2	4	2	-	9	3	4	5	6
24	1	5	2	4	4	3	-	1	1	7	4	3
25	2	2	1	7	4	1	-	7	2	3	2	5
26	4	2	3	5	3	3	-	3	5	3	3	3
27	3	3	2	3	7	1	-	1	4	6	1	3
28	1	5	3	2	2	4	-	3	5	1	3	3
29	2	-	5	2	6	2	-	6	7	3	8	4
30	1	-	1	4	6	2	-	4	3	4	3	1
31	7	-	4	-	3	-	-	1	-	1	-	1
Total	**91**	**97**	**109**	**102**	**113**	**115**	**-**	**93**	**117**	**123**	**112**	**100**

From the above table, this paper extracted the following information:

- There was no week in which there were no failures.
- The total number of power failures per month ranged from 91 to 123.
- Only 2 days, out of the 365 days of the year did not experience any power failure.
- The total number of power failures per day ranged from 1 to 11.
- There was no power supply at all in the month of July.

From their analysis of the fault data for the three years, the following information were unraveled:

Table 4. Inferences from Fault Data for Abakaliki Network in 2003

Year	**2001**	**2002**	**2003**
Total faults recorded	1271	1177	1070
Average consumers on the system	17,657	18,460	18,102
Average load (MW)	25.32	27.03	27.05
Maximum load (MW)	31.2	32.5	34.2
System interruption frequency index	0.07	0.06	0.06

Furthermore, it was discovered that the normal effective hours for PHCN Abakaliki District was 9 hours; the average monthly failure of the system was between 2.9 and 3.9; the monthly variability (spread) was between 3.24 and 5.95; and the system reliability decreased as the working hours increased. In other words, approaching the 9th working hour, the system reliability decreased to about 0.27.

Another study carried out by Okoronkwo and Nwangwu (2006) on the reliability of Enugu District of PHCN network for 2002, 2003 and 2004, revealed the following:

Table 5. Summary of 2004 Fault Data for Enugu Network (Source: PHCN Enugu District)

Day	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**	**Oct**	**Nov**	**Dec**
1	11	2	0	3	0	5	7	6	6	5	2	1
2	2	3	8	3	8	5	0	7	2	5	8	9
3	3	4	0	3	0	8	8	2	4	0	3	3
4	4	2	5	2	3	4	4	4	8	8	7	2
5	3	5	2	8	3	7	3	3	5	0	9	3
6	2	6	7	0	6	5	9	2	3	3	0	4
7	1	0	2	2	7	6	3	4	0	7	2	0

8	1	1	5	6	9	0	4	5	9	8	6	0
9	1	2	1	0	5	8	7	1	6	7	3	7
10	5	3	7	8	7	0	4	3	0	7	2	8
11	1	3	5	0	1	8	0	9	1	8	3	9
12	0	2	6	8	3	4	5	2	2	3	3	7
13	2	1	3	8	6	2	2	7	8	3	0	4
14	2	4	2	2	0	6	0	7	9	2	8	3
15	3	6	6	1	4	9	5	3	0	5	0	2
16	4	1	3	2	8	9	4	12	5	2	3	3
17	9	2	5	2	5	4	8	3	3	5	3	4
18	2	2	7	6	3	6	9	5	7	3	1	0
19	10	4	1	0	7	4	0	4	1	8	7	0
20	7	1	3	5	0	1	3	9	7	2	5	7
21	12	9	3	0	8	1	4	8	0	0	3	2
22	1	0	3	1	5	5	2	2	0	0	5	7
23	3	8	8	2	5	2	7	9	2	0	4	3
24	4	0	2	1	4	3	5	7	2	8	5	5
25	3	3	6	1	0	3	4	12	8	3	8	2
26	1	9	0	4	4	8	9	8	9	7	0	2
27	0	5	8	3	6	0	9	5	3	4	7	0
28	2	1	9	2	5	0	5	2	0	3	0	6
29	1	5	1	1	1	0	2	7	9	0	7	2
30	9	-	1	2	2	8	2	6	5	1	8	3
31	2	-	1	-	5	-	0	6	-	6	-	2
Total	**112**	**94**	**119**	**86**	**130**	**131**	**134**	**170**	**124**	**123**	**122**	**110**

The above table shows the fault data for only year 2004.

From the table, this paper discovered that:

- Every week experienced power failures.
- Only very few days (50) of the year experienced no fault.
- The total number of power failures per month ranged from 86 to 170.
- The total number of power failures per day ranged from 1 to 12.

From the fault data collected over the three years (2002, 2003 and 2004) the information below were derived:

Table 6. Inferences from Fault Data for Enugu Network in 2004

Year	**2001**	**2002**	**2003**
Total faults recorded	1084	1142	1463
Average consumers on the system	71,606	71,305	69,363
Average load (MW)	59.41	51.87	56.35
Maximum load (MW)	65.30	60.50	67.00
System interruption frequency index	0.02	0.02	0.02
Average failures per day	3.06	3.28	4.03
Failure rate (failures per hour)	0.13	0.14	0.17
Mean Time Between Failures (MTBF in hours)	7.96	7.36	5.96
System reliability (%)	62.86	60.93	55.68

This means that the rate of power failure was increasing by the year. Moreover, the system reliability decreased with increase in working hours which was a maximum of 8 hours. At 8 hours of working period, the reliability of the system decreased to about 30% (that is, 0.3).

Unfortunately, over the years and until now, the ugly scenario above has not even improved. Other areas of the country are also experiencing the same or even worse power problems than these. Therefore the rate of power failure in Nigeria now is abysmally high and practically inimical to any form of individual or national growth.

Corruption in the Power Sector

Perhaps the degree of corruption in Nigeria's power sector is the greatest problem militating against the realization of adequate and constant power supply in the country. These corrupt practices flow from the high places to the low places of both the government and the PHCN. Since early 1990s, successive administrations of the Federal Government have always come up with one power programme or the other without realizing any.

They often ended up in a corruption saga without anybody or group brought to book after all. This paper did not look at all of them for want of space.

According to Exclusive Power Probe Report (2008) of the House of Representatives Committee on Power, the sum of $16 billion was misappropriated in the power sector between 1999 and 2007. The committee recommended that 17 figures of interest should be investigated and/or disciplined. These figures include the then President of the Federal Republic of Nigeria, Ministers of power within that period, some federal legislators, some top management officers of PHCN, some top business men and some companies.

The report alleged a number of anomalies including willful manipulation of due process; granting of presidential waivers to contractors instead of going through due process; gross incompetence in managing PHCN and NIPP; project over-scoping; project cost inflation; awarding one contract two times or more; award of huge contracts to unregistered companies; calculated vandalism; sale of PHCN property by its workers; etc.

Not quite long after the committee submitted her report, in 2009 there was a counter scam against Mr Ndudi Elumelu, Chairman of the same House of Representatives committee on power that was probing the scam in the power sector. He was charged to court by EFCC on a 156-count charge bordering on the misappropriation of ₦5.2 billion meant for rural electrification contract. According to Olasanmi (2012) of Blue Print Newspaper, EFCC filed an appeal at the Abuja Court of Appeal against the same set of people on the same case following its dismissal by an Abuja Federal High Court headed by Justice Garba Umar.

Consequent upon the allegations and counter-allegations over the power corruption saga, the power probe committee was dissolved and never set up again. The entire country is still in the dark as to who is culpable – the said 17 personalities or Mr Ndudi Elumelu. The case is still in the court and yet undecided. The future of the case is even seemingly indecisive as the so-called power probe report has been cleverly silenced. The unfortunate reality on ground remains that huge sums of money have been lost to the power sector without a commensurate result to the economy. Nigeria is still grappling with severe power shortage and inadequate power supply.

Consequences of Poor Power Situation

The negative effects of irregular power supply are enormous. Power problem affects both individual and collective general and economic lives. Akinbuleri et al (2008) have it that in the absence of electricity, weaknesses are felt around the developmental growth of the nation. The following are some of the consequences of poor power situation:

- ***Inflation:*** Most establishments run on standby generators these days because of irregularity in the supply of electricity and whatever goods and services delivered by these establishments the money would pass down to the consumers. The consumers end up paying more than necessary because of the high cost of fuel for running the generators.
- ***Damage to Machines and Gadgets:*** Electric power interruption results in damage to production lines in factories. It also leads to damages of household electrical appliances and all these constitute economic waste.
- ***Fire Hazard:*** Several occurrences of fire hazards that are recorded in factories and elsewhere have been traced to incessant power interruptions and fluctuations.
- ***Robbery and Vandalism:*** During blackouts, it is very easy for robbers to operate in homes and banks; and for vandals to vandalize PHCN property.
- ***Pollution by Generators:*** Pollution caused by the fumes and noxious gases emitted by standby generators cause serious degradation to the environment and death to those who inhale them. Many lives have been lost to this hazard. Furthermore, noise pollution from the numerous generators around is discomforting.
- ***Lack of Technological Development:*** Where there is irregular electricity supply, there will certainly be no technological development as technology cannot thrive without electricity. This is the case with Nigeria and that is one strong reason Nigeria is not developing technologically.
- ***Poor Economic Activities:*** Poor power situation stalls a lot of economic and commercial activities. The economy is always kept at a standstill whenever there is power outage.
- ***Poor Academic Development:*** In the absence of electricity, it is difficult to grow academically. This is more so in recent times when many reading materials come in electronic format and studies with such materials cannot work without electricity to power the computer or whichever electronic gadget being used.
- ***Difficulty in Modern Communication:*** Since modern communication is strongly attached to electricity, absence of it hinders communication badly. This can cause a lot of damages or even an outright loss of life in the case of an emergency. Poor power situation has been blamed for the high tariffs being charged by the telecommunication companies in Nigeria, since they run their equipment with generators.

- ***Poor Medical Services:*** Poor power situation also leads to poor medical services as many activities in medical establishments now depend strongly on electricity. Such experiences can lead to loss of life or permanent injury at least.

Conclusion

There is no gainsaying the fact that the amount of electric power generated by Nigeria's power sector is grossly insufficient for the populace. This is why the country has helplessly resorted to a generator-based economy, which explains why it is still highly underdeveloped. To worsen the matter, the installations that generate the insufficient power are constantly suffering from incessant breakdown and poor maintenance culture. Sometimes they are vandalized and all these unfortunate activities lead to general irregularity in power supply.

Nigerians are being short-changed monthly by the so-called estimate bills. They end up paying for power that is grossly not commensurate with their bills.

On the other hand the lip service paid by successive administrations of the Federal Government of Nigeria over power programmes has also adversely affected the total amount of power generated. Furthermore, over-dependence on gas-fired plants for power generation has not also helped matters because whenever there is shortage of gas, power drops. Nigeria has for so long neglected energy sources like hydro, coal, etc, which are rather cheaper to run. It is expedient that a drastic measure is taken to change the current trend of events in the sector if Nigeria must grow.

Recommendations

The following points are recommended as ways of improving the power situation of Nigeria:

- There should be a sincere fight against corruption in the entire power sector including the Ministry of Power, by the relevant government anti-graft agencies. One of the ways to achieve this is by making fraud in the power sector a capital offence.
- Government should realistically embark on building of more power generating stations to increase the total power on the national grid. This should form part of government's medium and long term economic plan with targets set on the amount of power to be generate by the end of each year.
- Focus should be directed more on other sources of energy such as hydro, coal, wind, solar, etc, than on gas as is the current trend in the country. This is because gas-fired plants are used as peak load stations and not as base load stations. Their safe operation time is 3 hours per day as against hydro or coal turbine for instance, which can run for months consecutively without breaking down (Nwangwu, 2011).
- There should be regular training of the maintenance personnel of PHCN to maintain power installations. There should also be regular routine maintenance and periodic overhaul maintenance of the power equipment to keep the system running.
- Ring main system should be used in the transmission and distribution networks instead of the prevalent radial system. Ring main system ensures that power is still available to a greater section of the network whenever there is a fault and consequent power failure.
- Obsolete power plants should be replaced entirely with modern ones instead of grappling with the rigour of trying to source their parts.
- Power installations should be guarded by soldiers 24 hours of the day to stop vandalism. The way PHCN workers opposed Federal Government's intention to guard power facilities with soldiers is highly suspicious.
- Government should ban sale of power facility parts in the open market.
- Billing should be done by prepayment meter and not by the current method of estimate billing where consumers are most times over-billed. This over billing leads to failure of consumers to pay up and when they are disconnected they attempt reconnecting it themselves and some times, this leads to introduction of faults to the system.
- If government does not have the moral courage to play the parts that concern her as stated above, then she should sincerely privatize the power sector fully and allow competition and efficiency in service delivery to drive the sector just like the telecommunications sector.

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