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FACTORS AFFECTING POWER SUPPLY IN NIGERIA AND THE WAY FORWARD

ABSTRACT

Power supply system which is very important and critical to national, social and economy development of nation and it is composed of three stages which are generation, transmission and distribution. Power is created and generated from a location with either hydro power plant, thermal power plant or other method etc, it is transmitted to the load centers through transmission lines (Underground cables or overhead lines) and finally dispersed through distributing lines to the various consumers for uses. The power system in Nigeria has suffered major setbacks and neglects from previous and past Administrations in Nigeria and this has compounded the problems of the sector. Some of the problems are destruction of gas pipe lines by vandals ,wrong and illegal connection of electricity, over billing of the consumers, mismanagement of funds, non execution of awarded power projects or non executing it to the standard specified and bribery and corruption to mention but a few. Some suggestions were made that can actually improve sustainability, security, reliability and availability of power system if properly implement. Also alternative sources of energies such as solar, biomass, wind and hydro should be embraced to generate clean and smokeless energy to replace the convection methods of generating electricity. It was suggested that the National Control Centre (NCC) in Oshogbo should be decentralized for a stable, regular and constant power supply.

Keywords: Mismanagement, decentralized, illegal, consumers and corruption

INTRODUCTION

Power system is made up of three components which are generation, transmission and distribution. The last stage which is distribution delivers energy to different consumers such as residential, commercials and industrials consumers' .Regular, effective and stable power supply is fundamental to the economy development of any nation. A country that is experiencing elliptic power supply will definitely lag behind in her socio-economic activities. The power sector in Nigeria has her peculiar problem like every other segments of the economy. The problem in power sector is pronounced in the sense that it will affect both the common man and the rich and it also required in every sector of the economy. This review paper aim at discussing the multidimensional problems the power of Nigeria is facing (Sule, 2010). These problems are insecurity, bribery and corruption, overloading of transformers, diversification of gas/fuels required to power generating stations, mismanagement of public funds or non execution of awarded power projects. This review paper will open the eyes of the Nigerians and the Government at all levels to wake up from their slumber and to brace up for the challenges and the tasks ahead. Nigeria has a population of about 170 million, Nigeria project 20,000MW of electricity generation in the year 2020 and to be among 20 best economies country in the world. Her current available generating capacity, approximately estimated to be 6,000 MW, which can meet the growing and increasing population which is far below required demand that was approximately to be 15,000 MW. World Bank Report said, 55% of Nigerian have access to electricity and only 30% of these people are been met currently. For Nigeria to meet up with her

vision the private must invest in the sector such as generation, distribution and transmission and even in supply gas to drive the power station. It is only Transmission Company that the Federal Government owned, managed and controlled (Kaduna Electricity Distribution Company, accessed, 19/06/18).

POWER GENERATION IN NIGERIA

Electricity power plant was first installed in Nigeria in Lagos in 1896. These power plants were in isolated units and there were owned, managed, operated and controlled by people or authorities of these communities such as in Ibadan, Portharcourt, Kano or by works and service of Government ministries in these communities. Nigerian Colonial Government merged and aggregated these isolated units with the ordinance /decree No. 15 of 1950 that established Electricity Corporation of Nigeria (Uwaifo, 1994). The Niger dam Authority and the Corporation were established in 1962 to harness and develop the water resources of the River Niger by an act of Parliament of 1962 and this was later changed into National Electric Power Authority (NEPA) in 1973 by Federal Government through decree No.27,1972 (Uwaifo, 1994). The Ijora 'B' Power plant in Lagos was the first power plant to commission in Nigeria in 1956 by then Queen Elizabeth who was the head of the British Common Wealth. In early 1960s, a grid electricity transmission that connected many power stations (Kanji, Afam, Shirro, Egbin, Ogorode, Jebba and Ugheli) originated to power every State Capital in Nigeria and it was reported in 1992 that the installed energy capacity was about 5900Mw but the total available was 3000Mw and the maximum demand was placed at 2400Mw (Uwaifo, 1994). Babalola reported that in 2009, the generating capacity was around 5000MW but just 2900MWwas available as in November 2009. NEPA was later charged into Power Holding Company of Nigeria (PHCN) (Wikipedia, 2013).The PHCN unbundling process, under Establishment of the Electricity Power Sector Reform Act 2005 (EPSRA), created 11 semi-autonomous business units from its former distribution sector. Similarly, its transmission sector was unbundled into a semi-autonomous business unit known as Transmission Company of Nigeria, with the creation of the office of the market operator and system operator. The generation sector was subsequently unbundled into six semi-autonomous business units ***(Esan et al,2014)***. The unbundling of NEPA to PHCN and

now to 18 successor companies from NEPA comprising 6 Generation Companies, one Transmission Company that is managing by Federal Government and 11 Distribution Companies . The Lagos zone is now made up of two distribution companies namely Eko distribution Zone with head office at 24/25 Marina, Lagos and Ikeja distribution Zone with head office at Alausa, Opposite MITV, Ikeja. The data used in this thesis is collected from distribution network in Ikeja distribution Zone (Ikeja zone accessed, 19/06/18)

Brushless excitation systems called rotating rectifiers are use to maintain and stabilize the generator voltage and control the reactive power flow at 30KV at 50Mw - 1500Mw capacities (Hadi,2004).

Natural fuels like crude oil, coal, natural gas amounted to 180trillion cubic feet(Amotsuka, 2008) and large Rivers in Nigeria that are available led to utilization of steam gas turbine and hydro turbines for power generation at Delta, Egbin, Afam, Sapele, Kainji, Jebba, Shiroro and Monbila electricity generating stations.

ELECTRICITY GENERATING CAPACITY IN NIGERIA

In Nigeria today, Steam turbine generating plant, Hydro generating plant and gas turbine generating plant are commonly employed. Table 1 showed the electricity generating capacity in Nigeria. These generating station are interconnected in radial form which is called Nigeria National grid (NCC) located at Oshogbo so as to maintain availability and reliability of the system (Yusuf, Boyi and Muazu, 2007).

Table 1: **Existing Electricity generating stations: Source** (Awosope ,C.A,2014)

Existing Plants	Types	Installed Capacity (MW)	Available Capacity (MW)**	Year Commis sioned
Jebba	Hydro	578.4	165	1984
Kainji	Hydro	320	121	1968
Kainji	Hydro	200	-	1976
Kainji	Hydro	240	-	1978
Shiroro	Hydro	600	234	1990
Afam I	Gas	20.6	}	1963
Afam I	Gas	35	}	1965
Afam II	Gas	95.6	} 7	1976
Afam III	Gas	110	}	1978
Afam IV	Gas	450	}	1982
Ijora	Oil	6.7	-	1966
Ijora	Gas	60	-	1978
Delta I	Gas	72	}	1966
Delta II	Gas	120	} 22	1975
Delta III	Gas	120	}	1978
Delta IV	Gas	600	110	1990
Sapele GT	Gas	300	247	1981
Sapele ST	Gas	720		1978 & 1980
Oji	Coal	300	-	1956
Egbin	Gas	1320	718	1985
AES (Egbin IPP)*	Gas	270	-	2004
Total Existing Installed Capacity		**6538.3**	**1694.0**	

The Role of Government

Government needs to intervene on the issue of moderate and affordable electricity prices and ensure that the consumers get values for what their money especially what regular the tariff and also ensure reliable power system. The intervention of Government can be to combine one or all of the following; reducing and bearing the burden of high rate of foreign exchange on the retail tariff, reduce the shocking tariff, subsidize the price of gas employing in firing thermal power plants stations, back up the Generating companies and Distribution companies to have access to loan and finance from both Government and international agencies. (Kaduna Electricity Distribution Company, accessed online on 19/06/19)

COMMON FACTORS AFFECTING ELECTRICITY POWER SYSTEM IN NIGERIA

There are many factors that are affecting power supply in Nigeria, but they are not limited to the following:

- Distribution transformers in some areas in Nigeria are commonly overloaded and this has caused many serious problems affecting the adequate supply of electricity. Uwaifo (1994) said, “Since 1991, in Nigeria the average number of consumer per each distribution transformer increased to 220 compare to that of USA which is 10”.
- The Kidnapping of people in Nigeria both foreigners and even the indigenes of Nigeria is affecting the supply of gas to the gas generating stations.
- Irregular rainfall in Nigeria due to global warming has effect on hydro power station especially in the month of February to May when water level goes down as a result of draught (Sada, 2007).
- The destruction of oil and gas pipe lines in Niger Delta by vandals and militants is also a factor affecting stable power in Nigeria.
- Management of water in Nigeria is factor so as keep the water level of hydro power system during dry season.
- Inability of Nigeria Government to work in conjunction with multinational companies to explore gas potential in full capacity to generate power.
- Mismanagement in power sector and the corrupt nature of our leaders have negatively affected the sector.
- The development and research in power system is very weak and sufficient data are not available in the sector to use for planning and design and even for electric load forecasting
- Maintenance culture is been lack in Nigeria, in which planned, preventive routine maintenance is not carried out regularly and at a fixed time. Proper and good maintenance culture will lead to secure and regular power supply to the consumers

(Oroge, 1991).It will also help to check unplanned and unscheduled shutting down of power stations.

- Not harnessing the potential of renewable energies. There are many alternative sources of energies that can increase the generating capacity apart from her traditional means of generation such as thermal and hydro etc. Renewable energy such as wind solar, biomass and nuclear can compliment and supplement this conventional means of generating energy employing in Nigeria.
- Construction works such as roads, falling down of electric poles and towers and lines by wind and destruction of the equipment by thieves and erosion.
- The high losses in transmission lines are caused by the long distances between generating stations, consumers and load centers. (Yusuf, Boyiand Muazu, 2007).
- Electricity consumers in Nigeria are battling with exorbitant charges by the distributing companies that are supplying them power and this has caused many consumers not settle their electricity bills and also there is problem of poor delivery of electricity to the consumers and this discourage some consumers to pay up their bills as at when due.
- Stealing, illegal connections and increasing in maintenance cost of equipment due to vandals and thieves. Storms and winds also lead to low income generation by Distribution Company and the corrupt practice of electricity bills collectors.

CONCLUSION AND RECOMMENDATIONS

Regular, stable and constant supply of electricity to consumers and end users is important to social, economic growth and national growth of a nation. The Power sector in Nigeria has some peculiar and perennial problems. Challenges right from the inception of power generation are still persisting without any tangible solution. Many Government had come and gone and the

name has changed on different occasions but the multidimensional problems this unit has not changed and also the management has also changed but the problem are becoming complex and complicated. Destruction of oil and gas lines by vandals, corruption, misappropriation of public funds ,non execution of awarded power projects, overloading of transmission transformers, distribution transformers, Destruction of power lines by thieves, erosion ,winds and construction works are the multidimensional problems facing the industry which have reduce the efficiency of performance of the industry in return. The performance an index is defined as the efficiency, consumers' number connected to distribution line per transformer, transmission line losses (Copper losses) and high maintenance cost.

The generating capacity, transmission and distribution capacity can be increased if there is a good private and Government partnership in the sector and the citizens also work to together to ensure that proper things is done in the sector. Such as regular and prompt payment of charges, proper monitoring of power equipment and protest against illegal connections.

The following suggestion and recommendations will help the sector if there are adequately utilized:

- The bottleneck surrounding the acquisition of prepaid meters should be remove and let every consumer has accessed to it free of charge
- The power sector needs to be diversified and employ the use of renewable energy sources to generate clean energy which are ready available and abound in Nigeria.
- The National Control centre needs to be well positioned and restructured to reduce power losses .It can be restructured in such a way that each in region in the country will be controlled by a control centre to improve the availability and reliability and security of the system.

- The Federal Government should ensure that the billing system is friendly and common citizens can pay for whatever he or she consumed.
- The reigning Government should not abandon the power projects started by previous administration. Every Government should ensure that is completion of every awarded project irrespective of whoever awarded the project.
- The consumers should be faithful and loyal in settling of electricity bills
- Illegal connection of power should be guided against by the citizens and law enforcement agents and all relevant stakeholders
- Overloading of Transformers should reduced

REFERENCES

Awosope,C.A.,(2014),Nigeria Electricity Industry: Issues, Challenges and Solutions, Covenant University,Ota, 38th,Public Lecture

Amotsuka, P. O. (2008). Sustainable Agriculture in the Niger Delta Region: A case study of Fatima Community of Rivers State. A paper presented at 2nd National Conference of Colleges of Agriculture, Environmental, Engineering and science and Technology, Hassan Usman Katsina Polytechnic, Pp 1.

Babalola, R. (2009, November 6). 6000Mw Power Target Report Card, Daily Trust Newspaper, Volume 22, Number 94, p 1.

Donald G. F., Beaty H. W., Miley G. H. and Clapp A. L. (2000). *Standard Hand Book for Electrical Engineers* (14th Edition). New York: McGraw-Hill, USA, pp 52.

Hadi, S. (2004). *Power System Analysis* (5th Edition). New Delhi: Tata McGraw-Hill Company.

Oroge, C. O. (1991). Fundamentals of Reliability and Testing Methods (1st Edition). Kaduna: Sooji Press Ltd, Nigeria, p 115.

Sada, I. (2007). Analysis on Generation Transmission and Distribution of Nigeria Power for National development. A paper presented at 2nd National Conference of Colleges of Agriculture, Environmental, Engineering and Science and Technology, Hassan Usman Katsina Polytechnic, p 2.

Sule,A.H. (2010). Major Factors Affecting Electricity Generation, Transmission and Distribution in Nigeria. International Journal of Engineering and Mathmatical Intellegence,Vol. 1 Nos1&3.Pp 156

Uwaifo, S. O. (1994). Electric Power distribution Planning and development (1st Edition). Lagos:

Malt-house Press Ltd, Marina, Nigeria.

Yusuf J., Boyi J. and Muazu M. B. (2007). Regional Grid System Design Results for the Nigerian

Electric Power System with the Aid of Neplan. *Nigeria Society of Engineering Technical Transactions,* 42, (1) 18, 27.

Esan, W., Ogunbiyi, I. ,Oladipo, K. and Ajayi,O.,(2014),Electricity regulation in Nigeria: overview, https://content.next.westlaw.com, accessed on 18/06/18

Nigeria Electricity Regulation Commission, http://www.nercng.org/index.php/home/nesi, accessed on 18/06/18.

Kaduna Electricity Distribution Company http://www.nigeriaelectricityhub.com/2017/03/10/electricity-challenges-and-prospects, accessed on 19 /06/18

http://www.phcnikejazone.org. accessed on accessed, 19/06/18