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Cost Challenges Facing Nigerian Manufacturing Industries Using Generating Sets as Main Source of Power Supply

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Abstract: *Most manufacturing industries in Nigeria are currently experiencing hardship due to the high increase in price of diesel for fuelling the generating sets as alternate power supply because of epileptic power supply in the country. This has led to many industries relocating outside the country, loss of job and increment in price of goods and services. The aim of the study is to examine the threat facing the Nigerian manufacturing industries using generating sets as their alternate source of power. Some industries were considered in this research and in which some of the challenges facing the industry were itemized. Part of these problems includes; cost of fuelling and maintaining the generators, down time by the generating sets when there is break down of equipment and facilities, inability to satisfy the customer's needs on time due to irregular power supply. This research established the amount of fuel used by each of these industries visited to power their generators daily, weekly, monthly and also yearly, compared with the amount paid to Distribution Company (public utility). But these industries couldn't depend solely on the public utility power for their operations due to the epileptic power supply in the country. Hence, the necessity for a steady power supply using public utility is very important thereby reducing the cost of fuelling of generating set and cost of production of goods and services.*

Keywords: *Epileptic power supply, cost, manufacturing industries, generating sets, distribution company, challenges.*

1. INTRODUCTION

The manufacturing sector primarily produces and provides services not only to the Nigerian economy but also to the West Africa sub-region at large; and some semi-processed products are exported internationally to raise capital [1]. The reduction in growth or efficiency of the manufacturing industry in Nigeria can be attributed to the poor electricity supply in the country. It is an avenue for increasing productivity related to importation replacement and exportation expansion, creating foreign exchange earning capacity and raising employment and per capital income which causes unique consumption patterns. In terms of contribution to the gross domestic product, the manufacturing sector is dominant but it has been over-taken by the services sector due to the challenges facing the sector; one of the challenges is epileptic power supply.

Power is an essential commodity because every sphere of life is affected by it. Emerging economies especially needs constant availability of power since it is fundamental to national development. Most of the operations carried out for example in Nigeria depends on power. Power is needed by the mining sector, service providers sector and the manufacturing sector in order to carry out their operations. Industries, families, civil society, individuals and the state as a whole would be affected as a result of unavailability of electricity [2]. The import department industrialization strategy virtually came to a halt in the late 1970s and early 1980s when the liberal impart policy expanded the imports of finished goods to the detriment of domestic products. In this regard, Industrialization constitutes a veritable channel of attaining the lofty and desirable conception goals of improved quality of life for the populace. Industrialization process seems to be the main hope of most developing countries such as Nigeria with large population and large labour force. [3], World Bank Enterprise survey, reported that 322 private firms closed down in Nigeria between 2009 and 2014 due to stifling business regulations and lack of stable power supply. According to Manufacturers Association of Nigeria (MAN), has declared that 196 manufacturing companies shut down their operations between 2015 and 2017, [4]. And Nigerian Association of Chambers of Commerce, Industry, Mines and Agriculture (NACCIMA), said that at least 800 companies closed down in Nigeria between 2009 and 2011, due to harsh operating business environment, For instance, epileptic power supply was the key factor. Nigerian Industries as a whole operates on more than 70 percent of energy it generates using generators and operating these generators greatly increases the cost of manufacturing goods in Nigeria.

There are essentially five ways by which firms may respond to unreliable electricity supply, which includes nuclear steam, fossil-fuelled steam, gas turbine, solar inverter and hydropower. These are choice of location, factor substitution, private provision, choice of business and output reduction. While all these elements are presently observed among Nigerian firms, the most common approach has been through private provision.

The bar chat in figure1, shows the fuel consumption, maintenance and operation of each of the following sources of power; Hydropower, Nuclear steam, Fossil-fuelled steam and Gas turbine.

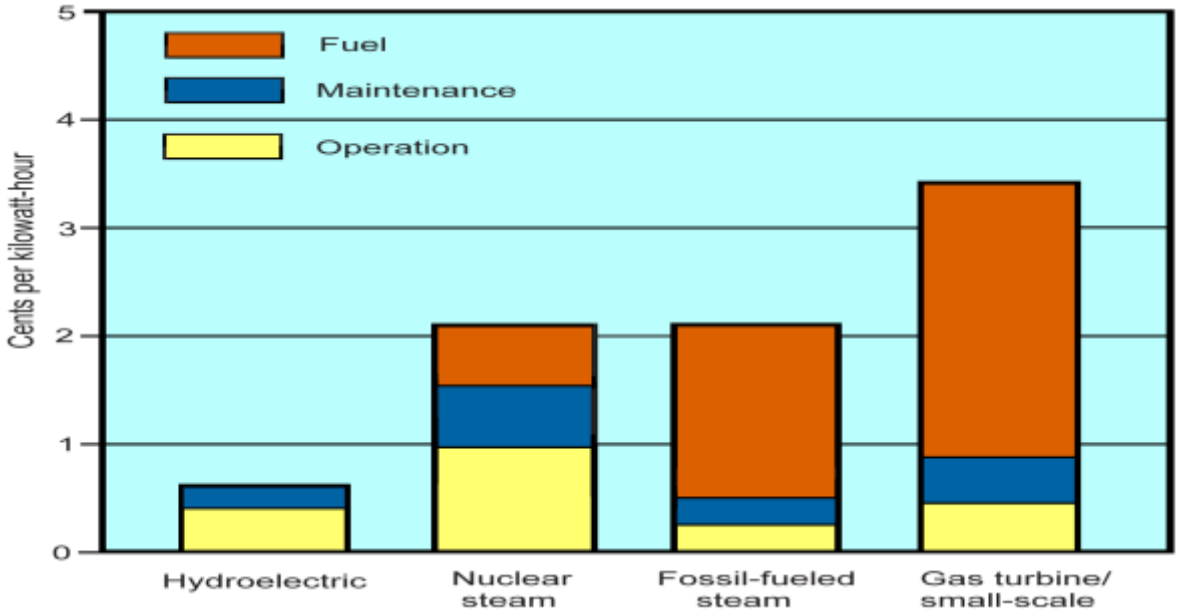

Figure 1: Bar chart for different types of power generation (Pdfs.semanticscholar.org)

Electricity consumers have responded to Hydro-electric power Distribution Company's inefficiency through self-generation. Electricity users, both firms and households, now finds it necessary to provide their own electricity in part or in whole to substitute or complement hydropower supply by factoring generator costs into the overall investment cost, thus raising significantly the set-up cost for manufacturing firms operating in the country. Incidentally, indigenous, small-scale enterprises are worse affected. [5], report that small-scale enterprises spend as much as 25% of the initial investment on self-provision of power with the use of generators. Banks also insist that firms seeking project loans must make provisions for investments in captive generating equipment [6]. Generators are by far the most prevalent source of power for emergency and standby power systems. For most commercial and industrial power systems, these will be engine-generator sets, with the prime-mover and the generator built into a single unit. For reciprocating engines, diesel engines are the most popular choice of prime-mover for generators, due to the cost of the diesel engines as compared to other forms of power and the relative ease of application. Gasoline engine generator sets are also available and are generally less expensive than diesel generator sets, but suffer from the disadvantages of higher operating costs, greater fuel storage hazards, and shorter fuel storage life as compared to diesel. Diesel generating sets were designed to provide an alternate back-up source of power if the normal source of power most often the serving utility should fail. As such, reliability of these types of systems is critical and good design practices are essential. These alternative power supplies include the use of Industrial Power Generating Plants, 250KVA, 630KVA, 700KVA, 1000KVA, 1250KVA, 2500KVA etc. And the analysis of this threat will be carried out by giving detailed illustration on the major consistent power supply (hydroelectricity), the alternatives and it threats to the health, environment and economy.

1.1 Diesel Engine

A diesel Engine (also known as a compression-ignition engine) is an internal combustion engine that uses the heat of compression to initiate ignition to burn the fuel that has been injected into the combustion chamber. As opposed to spark-ignition engines such as a petrol engine (gasoline engine) or gas engine (using a gaseous fuel as opposed to gasoline), which uses a spark plug to ignite an air-fuel mixture. The engine was developed by German inventor Rudolf Diesel in 1893. The diesel engine has the highest thermal efficiency of any standard internal or external combustion engine due to its very high compression ratio.

2. LITERATURE REVIEW

An This study seeks to trace the cost challenges +facing the manufacturing industries using generating sets as their major source of power and the importance of Public Utility Power (PUP) also known as the Hydro-power. And also establish cost-benefit analysis to prove that PUP is by far cheaper than generating sets for a mega power plant. It also

provides a brief analysis on the effects on the most developed countries, industrial users pay lower prices for electricity compared to other users [7]. The poor state of infrastructure supply in developing countries has a negative impact on their economic performance. For example, [8], reported that manufacturing establishments in Nigeria spend on average 90% of their variable costs on infrastructure, with electric power accounting for half of this share. With respect to the existing literature, most of the reviewed work done such as [9], was able to analyze the economic cost of power outages on businesses in Nigeria while [10], also tested the relationship between electricity supply, development of industrial sector and economic growth. [11], confirmed the effect of electricity supply and in-house generated electricity on business. Businesses are faced with the problem of high Electricity tariff rates, not minding other challenges that businesses are facing in other developing countries like Nigeria; which includes inadequate capital, poor technical and managerial skills, environmental effects and government rules and regulations which affect the operation of businesses in Nigeria. [12], investigated the effect of electricity tariff and self-generated power supply on business performance in Nigeria. The researchers did not investigate or establish the cost challenges facing the Nigerian manufacturing companies using generating sets as their major source of power as compare with the use of hydro-power. [13], said that there was no significant difference between effect of electricity bills and self- generated electricity on business performance. But was not specific about the type of the self-Generated power, either solar, wind or fossil fuel and also the cost challenges was not established.

As a result of power outages, firms lost an average of 792 working hours in 1998. Assuming a nine-hour working day, this translates to about 88 working days in 1998. Also, about 35% of the firms reported had to shut down production at one time or the other in the year as a result of power outages. [14], Nigeria spends N3.5trn annually on power generators, N17.9bn on importation of generators to Nigerian manufacturers, small scale businesses and families spend an average of N3.5 trillion yearly to power their generating sets with diesel and petrol due to unstable supply of electricity.

2.1 Energy use in Nigeria

The main sources of power in Nigeria are; electricity, fossil fuels, biomass; energy production is mainly obtained from biomass sources, hydroelectric dams, thermal electric plants and Sun (solar energy). Out of all these powers available, hydropower still remains the primary source of power in Nigeria, but due to insufficient supply of the primary source in the country, fossil fuels and other sources are imported to support the primary indigenous power production.

According to the Manufacturers Association of Nigeria (MAN), one of the most significant operational expenses is related to total energy cost. Given that electricity supply by the grid is challenging, many manufacturing companies are now embarking on their own power project [15]. The situation became more challenging in 2022 as diesel fuel cost rose from about N300/litre in January to over N800/litre by the end of the year, forcing many industries wishing to remain competitive to explore alternative options. Switching to natural gas by industries also fits well with the global movement to cut carbon emission while some are relocating to other countries [15].

The national president of Nigerian Association of Chambers of Commerce, Industry, Miners and Agriculture (NACCIMA) Ide John Udeagbala, said unfortunately the power sector has suffered consistent collapse resulting in the instability of power generation, distribution and supply with the implication being heavy reliance on alternative energy sources. The alternative sources of energy represent a significant portion of production costs for the private sector; diesel and Jet A1 fuel have become prohibitively expensive forcing a lot of enterprises to shut down or scale down their operation [16].

2.2 Challenges that has necessitated the inadequacy of public power supply as primary source of electricity

The problem that led to inadequacy of power supply in Nigeria can be classified as follows: government policy; economic factor; natural factor; society/community factor; effective energy management; skilled personnel; efficient technology and security factor [17]. Few of the challenges are explained as follows;

1) Government Policy

Government's inconsistent energy policies have been a major contributor to the Nigerian energy crisis. For instance, the government's policies for over fifty years now have been favouring monopoly in the power generation, transmission, distribution and sales. From the establishment of ECN in 1950 to the setting up of NEPA in 1972, the policy has been that of having an entity with full control of power generation and supply. If after these years, government is now bringing up policies to unbundle the power sector of the economy, then it is obvious that the earlier policies have not helped the system [18].

2) Inefficiency in Power Generation, Transmission, Distribution and Consumption

From the point of power generation in Nigeria, there is over fifty percent power loss. For instance, a study of Delta four power plants revealed a total average power generation of 30.5% out of the installed capacity [19]. This means that a total of 69.5% of power that would have come out of these four power plants and added to the national grid, is lost just at the point of generation. At the stage of transmission and distribution, a reasonable amount of power is also lost due to transmission lines and equipment that are grossly ill maintained or below capacity. According to the international Energy Agency report (2012), electric power transmission and distribution losses in Nigeria stood at 17.22% in 2010, and the maximum figure between 1971 and 2010 occurred in year 1981 where the loss stood at

49.27%. Figures 3.1 and 3.2 give a plot of electric power transmission and distribution losses in Nigeria from the year 1971 to 2010 in terms of total power loss and percentage loss of the total power generated, respectively [20].

3) Skilled Personnel

This is a general Nigerian problem where companies especially government firms, employ workers not based on merit and competence but on favouritism and tribalism. Because of this, no government company in Nigeria that requires workers with professional and technical competence has ever succeeded. NEPA and PHCN had staff, majority of which were employed through the back door and therefore, the only thing they seemed to know was how to climb electric poles and cut cables [18].

3. METHODOLOGY

Generating sets has been the main source of alternative power supply in Nigeria for over a long period of time following the non-availability of power supply by public utility from the national grid. During this research, Ondo State, Lagos State, Delta State and Edo State were chosen as case study, in which some selected industries using generating sets either as their backup or as main source of power were visited from the selected areas. The use of diesel generating sets as backup for reliable power supply at all times in-case the main public utility power supply fails. The public utility power is very crucial to the industrial growth, because it limit the cost of fuelling the generator (diesel), cost of buying the generating sets, repair during down time, cost of maintenance etc.

The following procedures were duly followed in carrying out the methodology:

a) Some industries were chosen as case study in which raw facts were gathered, which includes the cost of running their generating sets, maintenance of the generators compared with the amount being paid for the public power monthly.

b) Oral questions were asked from individual, some manufacturing industries using generating sets as their alternative source of power supply, in order to get some facts like the problem of maintenance, cost of fuelling the generators and how it's affect their of cost of production due to the epileptic hydro-power supply in the country.

c) Previous work done similar to this topic which was the effects of generating sets on both manufacturing industries and it environmental effects were also considered to sort for adequate information so as to ensure that the aim of the research was achieved.

4. RESULTS AND DISCUSSION

The fuel consumption per hour in litres based on the capacities and loads on each of the generator at a particular point in time, is shown in the Table1.

4.1 Cost of Fuelling of the Generator Sets at various Load Levels

The cost of fuelling the generating sets happens to be one of the greatest challenges facing the manufacturing industries due to the price of diesel fuel consumption rate of the generators. According to the research done, the fuel consumption of the generators depends on the capacity of the generators and work load on the generating sets at a point in time. Some generators of lower capacity like 800KVA, 1000KVA and 1250KVA, their fuel consumption ranges between 200 to 259 litres of fuel per hour with a full load on it, but these types of generators could only be used in small scale companies where their work loads are minimal. While the bigger manufacturing companies make use of two or more bigger generators like 2000KVA, 2500KVA etc. And the fuel consumption of such generators ranges between 500 to 600 litres of diesel per hour depends on the capacity and loads on the generators.

One drum of diesel is equivalent to 200 litres. The research based the fuel consumption for the sizes of generators used for this level of companies to be at an average of one drum (200litres) of diesel per hour as shown in the Table 2. The small scale companies visited during the research are; Federal University of Technology, Akure (FUTA), Primus Table Water Akure, Generator leasing company Lagos. The companies make use of both the public utility power and the alternative source of power (generating sets).

One drum of diesel = 200 litres
Price of diesel per litre = ₦ 800
The generators consumes 1 drum of diesel per hour (200 × 800) = ₦160,000
For 5hours a day equals (160,000 x 5) = ₦800,000

Monthly, the companies fuelled their generating sets with about (₦115,200,000), anytime they are to depend solely on the generating sets for 24hours. So for such companies to survive, there is need for public utility power to be stabled.

The bigger scale Industries visited are; Coop Cocoa Akure, Life flour mill Sapele, Etel Enterprise Nigeria Limited Sapele, Pure flour mill Apapa and Yongxing Steel Company Limited Benin City. These companies make use of the generating sets for their operations all through the twenty-four (24) hours without the use of the public utility power, because any break of power during the operations could cause damages worth of millions of naira on both the machineries and the products. The research finds out that these industries runs at least three (3) generators at once to be able to power all their machineries, this was because a single generator like 2500kvA couldn't have powered all the machines.

The sizes of generators used at this level for instance, 2500kvA consumes about 500 to 550litres of diesel per hour for a single generator. This research based the consumption rate to be at an average of 525litres per hour for a single generator as shown in the Table 3. In a month they spent average of nine hundred and seven million two hundred thousand naira only (₦907,200,000) to fuel their three (3) generating sets.

Diesel consumption per hour = 525litres

Amount (an price) diesel per litre = ₦800
The generator consumes more than two drums of diesel per hour (525 × 800) = ₦420,000

Table 1: Outlines an approximate diesel fuel consumption per hour in litres at various load levels (sales@fwpower.co.uk)

Generator Sizes	Approximate Diesel Fuel Consumption			
	¼ Load (litres/hr)	½ Load (litres/hr)	¾ Load (litres/hr)	Full Load (litres/hr)
8kW / 10kVA	1	1	2	3
10kW / 12kVA	1	2	3	4
12kW / 15kVA	1	2	3	4
16kW / 20kVA	1	3	4	5
20kW / 25kVA	2	3	5	6
24kW / 30kVA	2	4	5	7
32kW / 40KVA	3	5	8	10
40kW / 50kVA	3	6	9	12
60kW / 75kVA	5	9	14	19
80kW / 100kVA	7	12	18	25
120kW / 150Kva	8	16	24	32
160kW / 200kVA	10	20	30	40
200kW / 250KVA	13	25	38	50
280kW / 350kVA	19	38	56	75
400kW / 500kVA	27	53	80	106
640kW / 800Kva	43	86	129	172
800kW / 1000Kva	60	110	170	220
1000kW/1250kVA	65	130	194	259

Table 2: Cost of fuelling the generating sets for small companies.

Time	Time	Litres	Price/Litre (₦)	Amount (₦)
One hour	One hour	200	800	160,000
5 hours	5 hours	1,000	800	800,000
24 hours	One day	4,800	800	3,840,000
168 hours	One week	33,600	800	26,880,000
720 hours	One month	144,000	800	115,200,000
8,640 hours	One year	1,728,000	800	1,382,400,000

Table 3: Cost of fuelling the generating sets in bigger scale industries.

Time	Time	Litre	Price/Litre (₦)	Amount (₦) for one (1) generator	Amount (₦) for three (3) generators
1 hour	1 hour	525	800	420,000	1,260,000
5 hours	5 hour	2,625	800	2,100,000	6,300,000
24 hours	1 day	12,600	800	10,080,000	30,240,000
168 hours	1 week	88,200	800	70,560,000	211,680,000
720 hours	1 month	378,000	800	302,400,000	907,200,000
8,640 hours	1 year	4,536,000	800	3,628,800,000	10,886,400,000

Tables 4a and 4b compared the amount spent on generating sets and amount paid for the public utility power (hydro-power) by all the visited for both small scale and large scale companies within the country respectively.

Table 4a: Cost of fuelling generating sets compared with the amount paid for the public utility power (hydro-power) for the small scale companies

Research Places	Operation hours on generators	Total amount spent on fuelling the generators per day (₦)	Total amount spent on fuelling their generators per month (₦)	Amount spent on fuelling their generators per year (₦)	Average amount paid for public utility monthly (₦)
FUTA Generating Station, Akure	24hours	3,840,000	115,200,000	1,382,400,000	21,000,000
Primus Table Water Production Company	24 hours	3,840,000	115,200,000	1,382,400,000	13,000,000
Generator Sales and Leasing Company, Lagos	24 hours	3,840,000	115,200,000	1,382,400,000	15,000,000

Table 4b: Cost of fuelling generating sets compared with the amount paid for the public utility power (hydro-power) for the large scale industries.

Research Places	Operation hours on generators	Total Amount spent on fuelling the generators per day (₦)	Total Amount spent on fuelling one generators per month (₦)	Amount spent on fuelling their generators per year (₦)	Amount to be paid for public utility monthly for 24hrs supply (₦)
Coop cocoa, Akure	24 hours	30,240,000	907,200,000	10,886,400,000	251,280,388.45
Pure Flour Mill Apapa, Lagos	24 hours	30,240,000	907,200,000	10,886,400,000	500,761,433.30
Life flour mill sapele	24 hours	30,240,000	907,200,000	10,886,400,000	446,254,967.78
Etel Enterprise Nig. Ltd. Sapele.	24 hours	30,240,000	907,200,000	10,886,400,000	357,191,746.03
Yongxing Steel Company Benin	24 hours	30,240,000	907,200,000	10,886,400,000	509,180,803.33

Figure 2, shows the Histogram chart for the Table4A above which explains the cost of fuelling generating sets compares with the amount paid for public utility power monthly, by the small scale companies visited, which includes FUTA generating power station, Primus Table Water Akure and Generator Sales & Leasing Company Lagos.

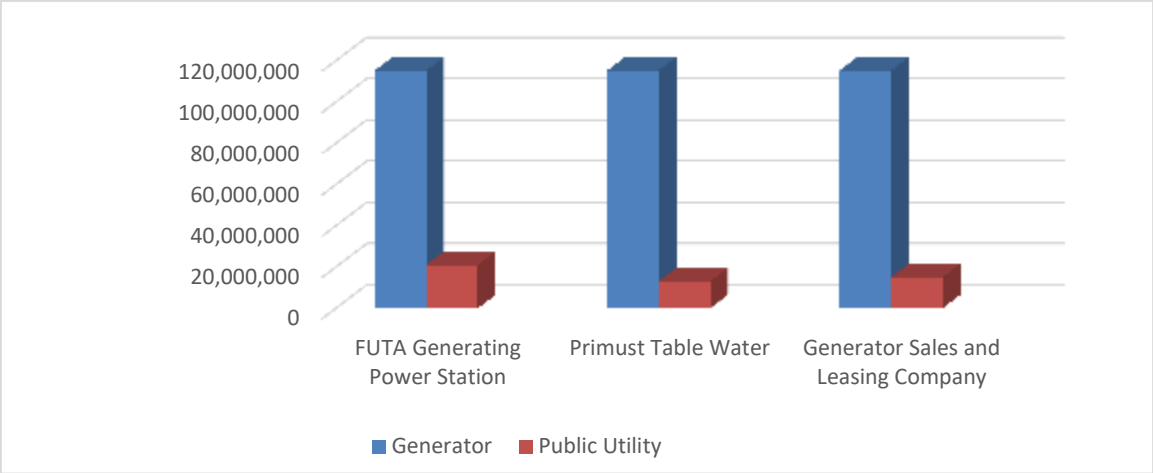

Figure 2: Cost of fuelling generating sets compared with the amount paid for the public utility power (hydro-power) for the small scale companies

Figure 3, shows the bar chart for Table 4b above which explains the cost of fuelling generating sets compares with the amount paid for public utility power monthly for large scale companies visited, which includes Coop cocoa Akure, Pure Flour Mill Apapa Lagos, Life flour mill, Etel enterprise Nig. Ltd. Sapele and Yongxing Steel Company Benin.

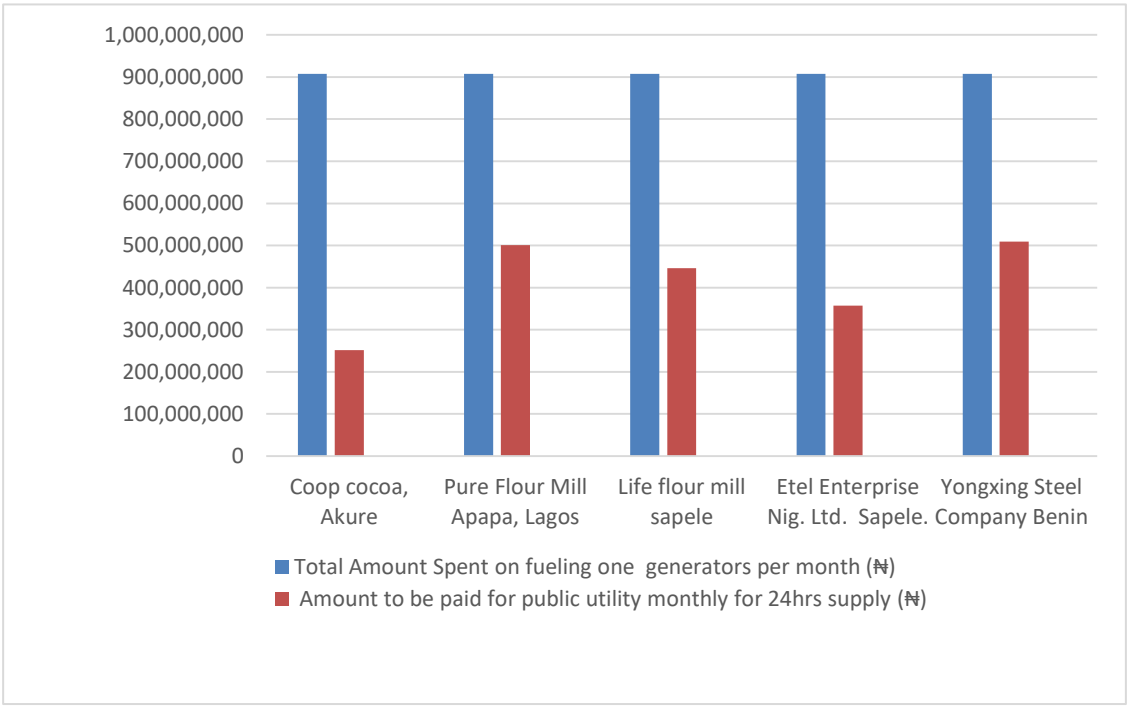

Figure 3: Cost of fuelling generating sets compared with the amount paid for the public utility power (hydro-power) for the large scale companies

4.2 Maintenance of the Generating Sets

Huge amount of money are used in maintaining the generators in order to have a constant and standard current from the generating sets. For maintaining the generating sets, daily maintenance is required on some parts of the generating sets to know either if these parts are in perfect condition or if there is need to change the wear and tear parts. Examples of these parts are the coolant level, oil level, the fuel level and charge of air piping while some parts are normally checked weekly which include the air cleaner, the battery charger, the drain fuel filter, drain water from fuel tank. More so there are some parts that has to be maintained every month, examples of these are coolant concentration, drive belt tension, drain exhaust condensate etc.

4.3 Down Time

The use of generating sets in Nigerian manufacturing sector has not been encourage due to the disappointment from the generating sets, because there might be sudden breakdown of the generator during operation which could lead to damaging the unfinished goods, even the machineries and equipment in use at the moment. The breakdown happens due to the excessive usage of the generators, which was beyond the designed objectives. The down time leads to time wastage, most especially when there is no hydro-power at the moment for alternative use. And the companies must pay their workers for all the downtime period in which they were unable to carry out any operation due to the breakdown from the generator, all these increases the expenses (overhead) of the companies which is not good for any manufacturing industry.

4.4 Damages on the Machineries as a result of using Generating Sets.

The use of generating sets causes damages on the machineries and equipment in the manufacturing industries. This happened as a result of the direct current supply from the generators to the machineries, the stability of power supply from the generating sets depends on the amount of loads carried by the generator, if the loads on the generator are higher than the capacity of the generator, the power supply would be unstable, as a result of fluctuation in the power supply by the generating sets, the machines would not be in it normal working condition which will definitely affect the induction motor of the machines, causes wear and tear in the parts of the machines regularly. The use of generating sets also slow down the work rate of the machines, which makes the efficiency of the machines to be lower compare with the use of normal electric power supply from distribution company.

5. CONCLUSION

From the statistical data collected and analyzed, it shows that the public power supply is more economical and efficient if it could be made available at all time. This is because the companies will save more money and also increases the production of goods and services thus increasing the employment rate in the country. Unfortunately, the reverse is the case in Nigeria and this has contributed immensely to the inflation in prices of goods and services from the Nigerian manufacturing companies. From this study, it could be concluded that the use of generating sets should be a backup for public power supply as the case may be and not as primary source of electricity supply to the Nigerian manufacturing companies.

REFERENCES

[1] Apeaning, W.R. (2012). Energy Efficiency and Management in Industries-A Case Study of Ghana's Largest Industrial Area.

[2] Adjei-Mantey, K. (2013). Household's Willingness to Pay for Improved Electricity Supply in the Accra-Tema Metropolitan Areas. *Retrieved April 3, 201, from http: www.ugspace.ug.edu.gh*

[3] Steel, W.F. & Webster L.M. (1991). Small Enterprises under Adjustment in Ghana. *World Bank Technical Paper No.* 138. The World Bank, Washington, D.C.

[4] MAN, Manufacturers Association of Nigeria; *http://www.manufaturersnigeria.org/MB-FAQ*

[5] Lee, K.S. & Anas, A. (1991). Manufacturers' responses to infrastructure deficiencies in Nigeria: Private alternatives and policy options. In A. Chibber and S. *Fischer, eds., Economic Reform in Sub-Saharan Africa*. A World Bank Symposium

[6] Ajayi, G.A. (1994). Cost-Benefit Analysis of Captive Power Generation by Manufacturing Industries in Nigeria. Central Bank of Nigeria, Research Department. *Economic and Financial Review, 32(4), 458 – 161*

[7] IEA. (2012). Energy Prices and Taxes, Quarterly Statistics, Second Quarter, *Paris*: *IEA.*

[8] Lee, K.S. & Anas, A. (1992). Impacts of Infrastructure Deficiencies on Nigerian Manufacturing: Private Alternatives and Policy Options. Infrastructure and Urban Development Department Report No. 98. World Bank, *Infrastructure and Urban Development Department,* Washington, D.C.

[9] Adebayo, I. (2010). The limits of privatization in a developing economy. Privatization of public enterprises in Nigeria. Ibadan*: Nigeria Economic Society Seminar Series*.

[10] Adekoya, F. (2023). Manufacturing firms can save 80 percent diesel cost by switching to gas; *The Guardian Jan 04, 2023*

[11] Faminu, G. (2022). Nigerian Association of Chambers of Commerce, Industry, Mines and Agriculture (NACCIMA) tasks Federal Government on policies to drive energy sufficiency; *Business Day, July 25.*

[12] Ellahi, N. (2011). Testing the relationship between electricity supply, development of industrial sector and economic growth: An empirical analysis using time series data for Pakistan, *International Journal of Management Science and Engineering Management*, 6(4), 272-277

[13] Olayemi, S.O. (2012). Electricity Crisis and Manufacturing Productivity in Nigeria (1980-2008). *Developing Country Studies*, 2(4).

[14] Olaoye, C. O. & Talabi, A. O. (2018). The Effect of Electricity Tariff and Self-Generated Power Supply on Business Performance in Nigeria. *Research Journal of Finance and Accounting*, ISSN 2222-1697, Vol.9, No.20.

[15] Rioja, F. (2003). The penalties of inefficiency infrastructure. *Review of development Economics*, vol.1, pp 127-137.Extracted from www.energrseries.org.
[16] Chioma, J. (2013). Importation of Generators to Nigerian Manufacturers, Small Scale Businesses and Families *Vanguard, Jan 16.*
[17] Oricha, J. Y. & Olarinoye, G. A. (2012). Analysis of Interrelated Factor affecting Efficiency and Stability of Power Supply in Nigeria. *International Journal of Energy Engineering*, 2(1).
[18] Ohajianya, A. C., Abumere, O. E., Owate, I. O. & Osarolude, E. (2014). Erratic power supply in Nigeria: Causes and Solutions. *International Journal of Engineering Science Invention*, Vol. 3 Issue 7, pp. 51 – 55.
[19] Oyem, I. L. (2013). Analysis of Nigeria Power Generation Sustainability through Natural Gas Supply, Journal of Innovative Research in Engineering and Sciences 4(1), 434 – 443.
[20] IEA statistics © OECD/IEA (2012). Energy Statistics and Balances of Non-OECD countries and Energy Statistics of OECD Countries and United Nations, Energy statistics yearbook, (http://www.iea.org/stats/index.asp), Retrieved: 3rd May, 2014.