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Energy Sector and Business Development in South Eastern Nigeria: 1990 – 2016

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Abstract:
The study examined Energy Sector and Business Development in Nigeria. Data were sourced from various publications of Central Bank of Nigeria, National Bureau of Statistics, National MSME Survey report 2013 of SMEDAN, Federal Ministry of Power. Ordinary Least Square (OLS) technique was used in the research work. The analysis revealed that energy sector has significant relationship with the business indicators such as manufacturing sub-sector output, energy generation relative to installed capacity, industrial production, labour, technology, import and export variables among others, used in the research work. The restructuring of the energy sector and its influence on business development have a positive relationship with the business growth. The increase in supply of energy sector enhances the business operations and business development of the South Eastern Zone. The research recommends that the Federal Government should provide adequate energy infrastructure for a reliable and efficient supply by granting more licences to qualified private investors, providing energy efficiency policies in the area of power.

Keywords: *Energy supply, energy generation, business growth, manufacturing sub sector*

1. Background of the Study

Energy remains the fulcrum on which all the socio-economic and technological development of every nation revolve and as such access to a reliable energy supply is considered vital for the operations of all business development. Unreliable energy supply therefore affects all sectors of business operations. Nigeria is seen as one of the greatest developing nations in Africa with highly endowed natural resources including potential energy resources. However, increasing access to energy in Nigeria has proved to be a continuous challenge (Odularu and Okonkwo, 2009). Thus to meet the growing needs of energy, Nigeria must address its persistent energy crisis, which according to Iwayemi (2008), has weakened the industrialization process, and significantly undermined the effort to achieve sustained business and economic growth, competitiveness of domestic industries within regional and global markets as well as employment generation. The energy sub-sector is associated with business development in relation to manufacturing and commerce, infrastructure, skill acquisition, Knowledge Based Economy – ICT, Technology Based investment, Agricultural Businesses, Solid Minerals and a host of others. Energy is one of the essential sub-sectors that play the most vital role in the overall development of nations. Thus energy consumption has become one of the indices for measuring the standard of living of a country.

The economic progress and business development in emerging economies have been underpinned to the crucial enabling role played by the energy sector. The energy sector significantly influences the vibrancy and sustainability of the entire economy ranging from job creation to resource efficiency. Energy sector's impact on the business development is great and has an input into nearly every good and service in the economy (Voser, 2011). Put simply, Energy Sub-Sector influences the functionality and performance of business Sub-Sector

Various governments in Nigeria, starting from military to civilian administrations, have embarked on energy restructure programmes as a means of addressing energy problems in the country, but not much was achieved in spite of huge capital expenditure provided for this in the national budget. The Nigerian Energy Sector has shown very low capacity. Transmission and distribution capacity are currently inadequate and insufficient. Thus, the Nigerian energy sector is characterized by numerous other problems particularly in the area of low power generation, transmission and distribution. The constraints have created a gap between demand for and supply of electricity, low local content in both technological and human resources input remains a major problem in the sector. In addition to this, the increase in gas

production necessary to supply the planned gas power stations and develop other gas-based industries and petrochemicals are yet to be stabilised.

1.1. Objectives of the Study

The study explores the influence of energy sector on the business development in South Eastern Zone of Nigeria. The *specific objectives* are:

- To determine the extent to which energy supply affects the manufacturing sub-sector of the South Eastern zone of Nigeria.
- To ascertain the influence of energy generation relative to installed capacity on business growth of the South Eastern zone of Nigeria.

1.2. Research Questions

- To what extent has energy supply affect the manufacturing sub-sector of South Eastern zone of Nigeria?
- What is the influence of energy generation relative to installed capacity on business growth of the South Eastern zone of Nigeria?

1.3. Research Hypotheses

- Ho_1*:* There is no significant effect of energy supply on the manufacturing sub-sector of South Eastern Zone of Nigeria.
- Ho_2: There is no significant influence of energy generation relative to installed capacity on business growth of the South Eastern zone of Nigeria.

2. Review of Related Literature

2.1. Conceptual/ Theoretical Clarifications

2.1.1. Energy Supply and Business Growth

Business Growth is a stage where the business reaches the point for expansion and seeks additional options to generate more profit. Business growth is a function of the business lifecycle, industry growth trends, and the owners' desire for equity value creation (Attract Capital, 2018). It is about expanding our products, services and target markets. Growth in energy supply sub-sector is a requirement for business, and in order to grow nation's revenue and profitability for economic growth.

Economic growth is an increase in real Gross Domestic Product (GDP) per capita occurring over some time period (McConnel, 2005), the increase in the inflation-adjusted market value of the goods and services produced by economy overtime. It is conventionally measured as the per cent rate of increase in real gross domestic product, or real GDP. The absence of energy deprives the citizens of a nation the bare minimum living standard; it constraints business and productive activities, results to economic limitations, and other constraints to the development of Nigeria. Nigerian economy and rapid growth of the population accompanied by a surge in the demand for household electricity, the pattern of energy use which varies with the citizen's economic status has been one of the major challenges in the energy supply. The Economists interest has been on efficacy of energy growth nexus in the country. High energy consumption/supply per capita is an important indicator of economic modernisation and growth (Adegbemi, Adegbemi & Babatunde, 2013). The gap between demand and supply of electricity can be traced to the ineffective and inadequate nature of facilities to boost supply.

2.1.2. Energy Generation and Business Growth

Electricity generation in Nigeria began in 1896. The Nigerian Electricity Supply Company (NESCO) commenced operations as an electric utility Company in Nigeria in 1929 with the construction of a hydroelectric power station at Kurra near Jos. The Electricity Corporation of Nigeria (ECN) was established in 1951, while the first 132KV line was constructed in 1962, linking Ijora Power Station to Ibadan Power Station. The Niger Dams Authority (NDA) was established in 1962 with a mandate to develop the hydropower potentials of the country. However, ECN and NDA were merged in 1972 to form the National Electric Power Authority (NEPA). In 1998, NEPA ceased to have an exclusive monopoly over generation, transmission, distribution and sales (Agagu, 2000).

Bacon, 1995, described the principle behind the energy reform movement in the developed and developing countries and said that part of it was capital scarcity and economic inefficiencies. The primary motivation for re-structuring in developed countries is to improve the operating efficiency of existing capacity and impose economic discipline on new capacity investment decisions in slower growing markets with more than adequate generation capacity and extensive transmission and distribution networks. These divergent motivations make re-structuring a higher risk activity in less developing Countries, using the Latin American Countries like Chile, Brazil, Columbia, Hondrus, and Brazil as example that dealt with related issues like dispatch of generation and energy shortages relative to demand at the prevailing retail price (Fisher and Galetovic, 2001).

This work is anchored on the theory of Natural Monopoly. Thus Natural Monopoly is a distinct type of monopoly that may arise when there are extremely high fixed costs of distribution, such as exist when large scale infrastructure is required to ensure supply. Demsetz identified the problem of Natural monopolies as one with no competition in the

market. A Private monopoly would exploit the market by charging exorbitant prices, resulting in creation of deadweight loss.

In 1880 there were three competing gas companies in Baltimore who fiercely competed with one another. They tried to merge and operate as a monopolist in 1888, but a new competitor foiled their plans. Thomas Aha Edison introduced the electric light which threatened the existence of all gas companies. From that point on there was competition between both gas and electric companies, all of which *incurred heavy fixed costs* which led to economies of scale. With regard to 'public' utilities, Gray records that between 1907 and 1938; the policy of state-created, state-protected monopoly became firmly established over a significant portion of the economy and became the keystone of modern public utility regulation. From that time on, the public utility status was to be the haven of refuge for all aspiring monopolists who found it too difficult, too costly, or too precarious to secure and maintain monopoly by private action alone. In support of this contention, Gray pointed out how virtually every aspiring monopolist in the country tried to be designated a 'public utility,' including the real estate, energy, air transport, coal, oil, and agricultural industries, etc. Some big businesses made effort to secure legal sanction for their monopolistic practices. Those lucky industries that was able to be politically designated as 'public utilities' also used the public utility concept to keep out the competition. In one of the first statistical studies of the effects of rate regulation in the electric utilities industry, published in 1962, George Stigler and Claire Fried land found no significant differences in prices and profits of utilities with and without regulatory commissions from 1917 to 1932. Early rate regulators did *not* benefit the consumer, but were rather 'captured' by the industry, as happened in so many other industries, from trucking to airlines. It is noteworthy, but not very laudable, that it took economists almost 50 years to begin studying the actual, as opposed to the theoretical, effects of rate regulation.

2.2. Empirical Review

Olaniyan (2010) in his research on the impact of the energy reforms on economic growth used Gambia and Burkina Faso. The research was for the periods of 35 years (1970 to 2005) he used Granger causality tests and co-integration analysis and came up with the result that energy reform does not cause economic growth of the Gambian and Burkina Faso.

Subair, and Oke (2008), studied the relationship in energy supply and economic development. They categorized the relationship into four on the basis of population and land space. Citing small countries with adequate energy such as Lesotho, they also mentioned Benin Republic as one with inadequate energy. While classifying South Africa and Ethiopia as big countries with adequate energy. He added that Nigeria and Benin Republic as one of the big countries with insufficient energy supply.

Kaseke and Hosking (2013), carried out a study on the relationship between energy consumption and Gross Domestic Product (GDP) in which they applied bi-directional causality and uni-directional causality in both directions, in different countries. A number of developing country-specific studies support the conclusion that energy supply enhances productivity. Using 1970-2000 panel data for South Africa, and a range of 19 infrastructure measures, Fedderke and Bogetic (2006) found that energy generation is positively related to labour productivity and total factor productivity growth in South Africa.

Akinlo (2008), in a research of energy sector on the relationship between consumption, economic and industrial growth for eight countries in sub-Saharan African used the autoregressive distributed lag (ARDL) bounds test in the study. The research finds that energy consumption is co-integrated with industrial and economic growth in Gambia, Cameroun, Ghana, Cote d'Ivoire, Senegal, Zimbabwe and Sudan. The result of the test showed a significant positive outcome on the industrial and economic growth in Sudan, Ghana and Senegal. The Author applied Granger causality test based on vector error correction model (VECM) that shows bi-directional relationship between energy consumption and economic growth for Ghana, Senegal and Gambia. Consequently, the Granger causality test revealed that economic and growth induces increase in energy consumption in Zimbabwe and Sudan. Akinlo (2008) in his analysis did not state the period covered in his investigation.

Wolak (2003), in his research work on ''Designing Competitive Wholesale Electricity Markets for Latin American Countries'' used the outcome from the Electricity Supply Industry restructuring in the United States, Europe and Austrian and New Zealand to identify the major challenges facing electricity market design processes. The result was that the extreme dependence of many LACs on hydroelectric power indicated that all the LACs with significant hydroelectric capacity had also experienced energy shortages, because it was constructed during state-owned monopoly.

Fisher, Gutierrez and Serra (2003), Stated in the effect of the energy sector reform of the economy of Chile on efficiency of businesses in an economy and the privatization of the electricity sector between 1985 and 1989. From then the proceeds and installed capacities were 4,016MW and 10,045MW respectively. The result of the research showed that unit cost of production declined, labour productivity increased, showing that during privatization businesses become profitable. The study indicated also that energy reforms helped to improve efficiency of businesses and social being of the people of Chile. The submission was not supported with any statistical evidence.

Moyo, (2012), in his study on the impact of power disruptions on firm productivity in the manufacturing sector in Nigeria shows that power outages variables (measured using hours per day without power and percentage of output lost due to the disruptions) have a negative and significant effect on productivity. The analysis for the study found that power outages have a negative and significant impact on productivity in small firms, but an insignificant effect in large firms, probably due to generator ownership patterns. According to the Manufacturing Association of Nigeria (MAN), the closure of 820 manufacturing companies in Nigeria between 2000 and 2008 was linked to the high costs of infrastructure (Akuru & Okoro, 2011). The study, focused on the effects of electricity on the unit cost of production, as an indicator of competitiveness. World Bank Enterprise Survey datasets, which include data on total sales and costs, were analysed to

determine whether firms with different characteristics have higher unit costs when exposed to outages. Total unit cost was defined as costs of a fraction of sales. This holds for SMEs that use generators during power outages, despite their higher cost of electricity, and it is consistent with that reported by Cissokho and Seck (2013) for SMEs in Senegal.

The model in Barro (2004) for the Mexico reforms on the power sector and workers productivity (as cited in Noriega and Fontenla, 2005), applied time series econometrics: bi-variate vector auto regression and long run derivative covering periods of 1950 to 1994. The result of the Mexico reform was positive for two to three years, and revealed a significant effect on real output per worker. This effect was permanent for a period of twenty (20) years. Therefore, it becomes manifest only after a long while.

Borenstein, Bushnell and Wolak (2002) in their research on 'Measuring Market Inefficiencies in California's Restructured Wholesale Electricity Market', stated that the major cause of the California electricity crisis was the fact that California's three large load-serving entities purchased 100% of their total energy and ancillary service requirements from day-ahead and shorter-horizon spot markets. This resulted to their making unilateral profit-maximizing mark-up of price above the marginal cost of producing electricity.

Jamasb, (2004), in the Nigerian context the discourse on the energy reform had been on and the author in his research on the impact of energy sector reform. He used data on the privatization of energy supply in Nigeria, with the result showing that the reform led to capacity utilization and lower prices. He also disclosed that the unbundling of the energy sector impacted positively on the economic efficiency and business performance of Nigeria after using the standard structure-conduct-performance model to test the effect of the market structure.

2.2.1. Energy Supply and Manufacturing Sub-sector

In the South Eastern Zone of Nigeria there are so many industries, sea ports, oil deposit and oil companies; and energy supply (Power supply) is considered as essential and key element of modern industrialization especially in the Eastern Zone where most of their activities notably are driven by power in every aspect like iron-welding that has increased dominance of electricity usage. Industrialization is the transformation of a society from an agricultural based society to that of the manufacturing of goods and services. Energy supply, today, are needed for communication, internet, running of factories, hospitals, water Board for water treatment etc. For Nigeria to meet up with their development plans of industrialization there is need to boast the nation's energy supply directed towards those essentials that drive the business development. A business is an enterprising entity engaged in commercial, industrial or professional activities. A company transacts business activities through the production of a good, offering of a service or retailing of already manufactured products.

Business Development is the activity of pursuing strategic opportunities for a particular business or organization and it is primarily measured in terms of its impact on people. Business development is accompanied by interventions on the artisans and small businesses. Development hinge on what socio-economic goals are being advocated by the development agency, government or analyst who are involved in desirable changes in the economic, political and social conditions of the society according to Pearce and Warford (1993), such attributes include access to energy products.

2.2.2. Energy Generation and Business Growth

Electricity generation in Nigeria began in 1896. The Nigerian Electricity Supply Company (NESCO) commenced operations as an electric utility Company in Nigeria in 1929 with the construction of a hydroelectric power station at Kurra near Jos. The Electricity Corporation of Nigeria (ECN) was established in 1951, while the first 132KV line was constructed in 1962, linking Ijora Power Station to Ibadan Power Station. The Niger Dams Authority (NDA) was established in 1962 with a mandate to develop the hydropower potentials of the country. However, ECN and NDA were merged in 1972 to form the National Electric Power Authority (NEPA). In 1998, NEPA ceased to have an exclusive monopoly over generation, transmission, distribution and sales (Agagu, 2000).

Bacon, 1995, described the principle behind the energy reform movement in the developed and developing countries and said that part of it was capital scarcity and economic inefficiencies. The primary motivation for re-structuring in developed countries is to improve the operating efficiency of existing capacity and impose economic discipline on new capacity investment decisions in slower growing markets with more than adequate generation capacity and extensive transmission and distribution networks. These divergent motivations make re-structuring a higher risk activity in less developing Countries, using the Latin American Countries like Chile, Brazil, Columbia, Hondrus, and Brazil as example that dealt with related issues like dispatch of generation and energy shortages relative to demand at the prevailing retail price (Fisher and Galetovic, 2001).

When a business begins to sell more products or generate more service income, the business brings in more money and is considered to be growing. When a business is able to cut costs and net more money from raising profitability, it also grows. Successful businesses have success in both areas, and success in one area (especially in the area of efficient energy supply) often leads to another and is sometimes able to get a better price for its goods, which reduces overhead. When overhead is reduced, businesses pass on savings to the customers and attract more sales. The energy supply has chain reaction to business operations and activities (Business Dictionary.Com, 2018).

3. Methodology

The research design adopted for this study is the *ex post facto* design being a suitable technique for time order assessment of variables using time series data from the periods 1990 – 2016 on the energy sector and business development of south eastern zone of Nigeria. Moreover, the suitability of this choice was based on the fact that the design allows researchers to establish the time sequence of the variables on the basis of logical considerations. Data was sourced

from the Central Bank of Nigeria (CBN) statistical bulletin, National Bureau of Statistics (NBS) publications, National MSME survey report 2013 of SMEDAN, Federal Ministry Power.

3.1. Manufacturing Equation

This equation assesses the extent to which energy supply affect manufacturing sub-sector of south eastern zone of Nigeria.

The estimation model is as highlighted below:

$MANU = f(ENE, INDP, CAPU, TECH, GDP, LAB)\ e_t$ (i)

This can be restated as follows:

$MANU = a_{o+}a_1 LENES+a_2LINDP+a_3LCAPU+a_4LTECH, +a_5LGDP +a_6LLAB + \xi_t$ (ii)

Where:

ξ_t	=	represents the stochastic term, Error
$a_{o-}a_6$	=	represents parameter estimates/structures
LMANU	=	Log of Manufacturing
LENE	=	Log of Energy supply
LINDP	=	Log of Industrial Production
LCAPU	=	Log of Capacity Utilization
LTECH	=	Log of Technology
LGDP	=	Log of Gross Domestic Product
LLAB	=	Log of Labour

Manufacturing refers to range of human activity from handicraft to high tech but it is most commonly applied to industrial production in which raw materials are transformed into finished goods on a large scale. It is also presented as dependent variable and has a functional relationship with energy supply, industrial production, capacity utilization, technology, gross domestic product and labour. A boost in manufacturing production offers prospects of a growing availability of manufactured products and increased employment. Energy supply is the delivery of transformed fuels to point of consumption. It potentially encompasses the extraction, transmission, generation, distribution and storage. This is required to keep economic activities going especially manufacturing and industrial sub-sector of the economy. Industrial production measures the physical volume of output of nation's manufacturing sector including factories and utilities, and this formed part of the key indicator. Hence electricity supply is an instrument of industrialization. Capacity utilization is the extent to which the productive capacity of a plant, organization is being used in generation of goods and services. The capacity utilization of electricity power plants in the South Eastern Zone has been very low that most rural communities are not connected to the national grid system and therefore lack the electricity-based infrastructures that would empower the establishment of social and industrial amenities. Technology is fixed asset and a long term tangible piece of property uses in the production of its income which is expected to be later converted into cash. It is also a process of transforming scientific discoveries into realities. Gross Domestic Product is a total market value of all final goods and services produced in a country during a given period of time. Labour form the aggregate of all human physical and mental effort used in creation of goods and services. Labour is a primary factor of production. The size of a nation's adult population and the extent to which the adults are either working or are prepared to offer their labour for wages is defined as labour.

3.1.1. Business Growth Equation

The equation ascertains the influence of energy generation relative to installed capacity on business growth of south eastern zone:

$GDP = f(ENES, MANU, INDP, IMP, EXP, CAPU, EXCHR, BOP)$ (iii)

$GDP = bo+b_1 LENES+b_2LMANU+b_3LINDP+b_4LIMP+b_5LEXP +b_6CAPU + b_7EXCHR+b_8LBOP + \xi_t$ (iv)

where:

$b_1 – b_2$	=	*Parameter estimates/structures*
e_t	=	*error term*
LGDP	=	*Log of Business Growth*
LENES	=	*Log of Energy Supply*
LMANU	=	*Log of Manufacturing*
LINDP	=	*Log of Industrial Production*
LIMP	=	*Log of Import*
LEXP	=	*Log of Export*
LCAPU	=	*Log of Capacity Utilization*
LEXCHR	=	*Log of Exchange Rate*
LBOP	=	*Log of Balance of Payment*

Gross Domestic Product is the total market value of all final goods and services produced within a nation's geographic borders over a period of time. Energy supply is the delivery of fuels or transformed fuels to point of consumption. It potentially encompasses the extraction, transmission, generation, distribution and storage. Manufacturing refers to range of human activity from handicraft to high tech but it is most commonly applied to industrial production in which raw materials are transformed into finished goods on a large scale. A boost in manufacturing production offers prospects of a growing availability of manufactured products and increased employment. Industrial Production measures

the physical volume of output of nation's manufacturing sector including factories; it is a key economic indicator in macro economic analysis. Hence electricity supply is an instrument of industrialization. Import is goods/services brought into a jurisdiction, especially across a national border, from an external source for purpose of trade. Export refers to selling goods and services produced in the home country and exported at a particular point in time to another country. Capacity Utilization is the extent to which the productive capacity of a plant, firm or country is being used in generation of goods and services expressed usually in percentage. It is computed by dividing the total capacity with the portion being utilized. The capacity utilization is the extent to which the productive capacity of a plant of a plant or Country is being used in generation of goods and services. The capacity utilization of electricity power plants in the South Eastern Zone has been very low that most rural communities are not connected to the national grid system and therefore lack the electricity-based infrastructures that would empower the establishment of social and industrial amenities. Exchange rate is the current market price for which one currency can be exchanged for another. Balance of Payments (BOP**)** is the record of all economic transactions between the residents of the country and the rest of the world in a particular period (over a quarter of a year or more commonly over a year).

4. Data Presentation and Analysis

MANU = f (ENE, INDP, CAPU, TECH, GDP, LAB) e_t (i)

Year	Gross Domestic Product (N Billion)	Energy Supply (Power) (Megawatt per Hour)	Capacity Utilisation Rates (%)	Technology (Electricity to GDP) (N'Billion)	Labour (N'Million)	Industrial Production (1985=100)
1990	472.65	1536.9	40.3	8.87	16561.98	130.6
1991	545.67	1617.2	42.0	9.28	20845.48	138.8
1992	875.34	1693.4	38.1	10.35	18129.88	136.2
1993	1089.68	1655.8	37.2	10.50	16753.91	131.7
1994	1399.70	1772.9	30.4	11.28	14171.02	129.2
1995	2907.36	1810.1	29.3	11.10	13664.35	128.8
1996	4032.30	1854.2	32.5	11.34	13906.01	132.5
1997	4189.25	1839.8	30.4	11.27	14084.15	140.6
1998	3989.45	1724.9	32.4	10.54	14545.89	133.9
1999	4679.21	1859.8	34.6	10.68	14861.82	129.1
2000	6713.57	1738.3	36.1	10.89	15082.82	138.9
2001	6895.20	1689.9	42.7	12.38	8638.29	144.1
2002	7795.76	2237.3	54.9	12.38	8112.12	145.2
2003	9913.52	6180.0	56.5	15.92	7041.06	147.0
2004	11411.07	2763.6	55.7	16.47	62869.23	151.2
2005	14610.88	2779.3	54.8	18.25	39940.32	158.8
2006	18564.59	3907.6	53.3	19.44	44243.71	152.3
2007	20657.32	3150.2	54.6	20.34	49017.75	154.1
2008	24296.33	3279.0	54.2	21.30	44400.59	155.1
2009	24794.24	3445.6	54.0	22.04	45887.35	153.8
2010	54612.26	3291.6	54.3	22.68	46435.23	154.3
2011	62980.40	3338.8	54.2	23.35	45574.39	154.4
2012	71713.94	3358.7	54.2	24.02	45965.66	154.2
2013	80092.56	3329.7	54.2	24.78	45991.76	154.3
2014	89043.62	3342.4	54.2	25.58	45843.94	154.3
2015	94144.96	3343.6	54.2	-	45933.79	154.3
*2016	91594.26	3343	54.2	12.79	45888.9	154.3

Table 1: Manufacturing Equation
Sources: CBN Statistical Bulletin, CBN Annual Abstract, NBS (2016), Nigerian Electricity Regulatory Commission (NERC), Federal Ministry of Power

Key:

LENE = log of Energy supply
LINDP = log of Industrial Production
LCAPU = log of Capacity Utilization
LTECH = log of Technology
LGDP = log of Gross Domestic Product
LLAB = log of Labour
GDP = f (ENES, MANU, INDP, IMP, EXP, CAPU, BOP, EXCHR) (iii)

Year	Manu. (1990= 100)	Energy Supply (Power) (MW per Hour)	Capacity Utilisation Rates (%)	Import (₦Million)	Export (₦million)	Industrial Prod (1985=100)	BOP (₦million)	EXCHR (₦ per Unit of Foreign Currency)
1990	100.0	1536.9	40.3	45717.9	109886	130.6	18498.2	131
1991	109.3	1617.2	42.0	89488.2	121535	138.8	5959.6	131
1992	112.2	1693.4	38.1	143151.2	205612	136.2	-65271.8	131
1993	89.3	1655.8	37.2	165629.4	218770	131.7	-95271.8	131
1994	88.5	1772.9	30.4	162788.8	206059	129.2	-42623.3	131
1995	83.7	1810.1	29.3	755127.7	950661	128.8	-195316.3	131
1996	85.1	1854.2	32.5	562626.6	1309543	132.5	-53152.0	131
1997	85.0	1839.8	30.4	845716.6	1241663	140.6	1076.3	131
1998	81.7	1724.9	32.4	837418.7	751859	133.9	-220675.1	131
1999	84.5	1859.8	34.6	862515.7	1188960	129.1	-32664.3	131
2000	84.8	1738.3	36.1	985022.4	1945723	138.9	314139.2	131
2001	84.5	1689.9	42.7	1358180.3	186794	144.1	24738.7	131
2002	89.8	2237.3	54.9	1512695.3	1744178	145.2	-563483.9	131
2003	90.3	6180.0	56.5	2080235.3	3087886	147.0	-162298.4	130
2004	89.4	2763.6	55.7	1987045.3	4602782	151.2	1124157.2	133
2005	89.4	2779.3	54.8	2800856.3	7246535	158.8	-1473537.1	130
2006	88.1	3907.6	53.3	3108519.3	7324681	152.3	-2406340.6	128.29
2007	89.0	3150.2	54.6	3911952.6	8309758	154.1	-2379064.66	121
2008	88.8	3279.0	54.2	5238195.2	10114738	155.1	-4314504.58	127
2009	88.6	3445.6	54.0	5116459.7	8402151	153.8	-3927487.97	150.85
2010	88.8	3291.6	54.3	7614656.2	11542024	154.3	-2470728.58	150.85
2011	88.8	3338.8	54.2	10235174.2	14240232	154.4	-1099997.48	155.71
2012	88.7	3358.7	54.2	9109032.5	15002868	154.2	-1242324.17	157.31
2013	88.8	3329.7	54.2	9672103.4	14621550	154.3	-117116083	157.9
2014	88.7	3342.4	54.2	9390568	14812209	154.3	-1206742.5	157.6
2015	88.7	3343.6	54.2	9531336	14716880	154.3	-59161412.8	157.8
*2016	88.7	3343.0	54.2	9460951.5	14764544.3	154.3	-30184077.7	157.7

Table 2: Business Growth (GDP)

Sources: CBN Statistical Bulletin, CBN Annual Abstract, NBS (2016), Nigerian Electricity Regulatory Commission (NERC), Federal Ministry of Power

Key:

LENES	=	Log of Energy Supply
LMANU	=	Log of Manufacturing
LINDP	=	Log of Industrial Production
LIMP	=	Log of Import
LEXP	=	Log of Export
LCAPU	=	Log of Capacity Utilization
LBOP	=	Log of Balance of Payment
LEXCHR	=	Log of Exchange

Method of Estimation = Ordinary Least Squares

Dependent Variable:	ENE				
Current Sample:	1990 – 2016				
Number of Observations:	27				
Mean of dep. Var.	=	15.0886	*LM het. Test*	=	.779561 [.377]
Std. dev. of dep. Var.	=	.1.95346	*Durbin – Watson*	=	1.45978 [.006, .227]
Sum of squared residuals	=	2.60797	*Jarque – Bera test*	=	.503095 [1778]
Variance of residuals	=	.096588	*Ramsey's RESET2*	=	.199374 [.659]
Std. error of regression	=	.310786	*F (zero slopes)*	=	299.437 [.000]
R – Squared:	=	78485	*Schwarz B.I.C*	=	13.9551
Adjusted R –squared	=	.885728	*Log likelihood*	=	-5.29079

Variable	Estimated Coefficient	Standard Error	t-statistic	p-value
ΔC	14.1654	.571100	4.5506	[000]
ΔLMANU	.755756	.061733	-2.52305	[0.18]
ΔLINDP	.782174	.23864	2.2142	[.000]
ΔLCAPU	.530516	.048762	3.77817	[.000]
ΔLTECH	.812749	.050016	.254903	[.901]
ΔLGDP	.642831	0.32262	-2.4181	[.700]
ΔLLAB	.88755	.26715	-1.9972	[.184]

Table 3: Regression Result: Energy Supply and Manufacturing Sub-sector
Source: Gret-L Package (2017)

A close look at regression result in respect to objective 1 of the study, that is, effect of Energy supply on Manufacturing sub-sector reveals that the coefficient of estimated constant term in Table 3 is 14.1654 and its statistically significant and better at 0.1 per cent which shows a functional relationship between the energy supply and manufacturing sub-sector of south eastern zone.

The coefficient of MANU when regressed with energy is positively signed and statistically significant at 0.02 per cent. This indicates that improvement in the energy sub-sector, subsequently leads to an improved and sustained business development. Similarly, when Energy sub-sector is regressed with Industrial Production, the estimate coefficient is positively signed and is statistically significant at 0.1 per cent. This implies also that there exists a relationship between energy and industrial production.

In the same vein, the coefficient of Capacity Utilisation (CAPU) carries a positive sign and also statistically significant and better at 0.1 per cent. This indicates that supply enhances Capacity Utilisation as well as Industrial Utilisation. The coefficient of Technology and Business Growth is positively signed and both are statistically significant, implying that increase in energy supply facilitates technology and business growth, thereby fostering business development.

The coefficient of Labour force is positively signed and fairly significant at 0.2 per cent. Durbin –Watson of 1.45978 is greater than Adjusted R-squared (R^2) .88755. This indicates that there is no spurious auto-correlation in the model and it goes to explain the explanatory part of the model; thereby confirming that the energy sub-sector contributes meaningfully to the business development.

Table 4: shows regression result of the influence energy generation relative to installed capacity on Business Growth of South Eastern Zone.

Method of Estimation = Ordinary Least Squares

Dependent variable:	GDP				
Current Sample:	1990 – 2016				
Number of Observations:	27				
Mean of dep. Var	=	13.7242	*LM het. Test*	=	.188187 [.170]
Std. dev. of dep. Var.	=	2.28953	*Durbin-Watson*	=	2.13692 [.243, .935]
Sum of squared residuals	=	48.4249	*Jarque-Bera test*	=	229.878 [000]
Variance of residuals	=	1.86250	*Ramsey's RESET2*	=	.852349 [.365]
Std. error o regression	=	1.36473	*F (Zero slopes)*	=	12.2497 [.000]
R-square:	=	905060	*Schwarz B.I.C*	=	62.4317
Adjusted R-squared	=	.811783	*Log likelihood*	=	-52.0345

Variable	Estimated coefficient	Standard Error	t-statistic	p-value
ΔC	24.0821	5.71094	4.21683	[000]
ΔLENE	.64435	.258218	-.171697	[.865]
ΔLMANU	.628694	.363010	1.71697	[.865]
ΔLINDP	.639169	.302385	2.129534	[.898]
ΔLIMP	.419814	.235599	-.508551	[.615]
ΔLEXP	-5.57325	1.27755	-2.01420	[.054]
ΔLCAPU	.546684	1.441361	2.34548	[0.411]
ΔLEXCHR	.681459	.384020	2.00831	[0.521]
ΔLBOP	.52448	.200121	1.98991	[0.015

Table 4: Regression Result: Energy Generation and Business Growth
Source: Gret – L Package (2017)

Examining the regression result in respect of the influence of energy generation relative to installed capacity on business growth reveals an interesting picture, in that the coefficient of the constant term 24.0821 and it is statistically

significant and better at 0.01 per cent, this shows that energy generation is relative to installed capacity on business growth meaningfully.

When energy generation is regressed in Gross Domestic Product (GDP), the coefficient estimate carries a positive sign and it's statistically not significant. This is indeed at variance with apriori expectation. The coefficient of MANU is positively signed and it's fairly significant, implying that the increase in energy generation and supply contributes to increase in business growth. The coefficient of the Industrial Production also carries a positive sign and statistically significant, which implies that Industrial Production facilitated by energy generation relative to installed capacity lead to improvement on business growth.

The coefficients to Import and Export in relation to business development of south eastern zone of Nigeria are statistically significant, except Import which is against *apriori* expectation; this implies that business development, facilitated by satisfactory energy supply encourages Export of goods and services which subsequently result in better business growth.

Similarly, the coefficient of Capacity Utilisation (CAPU) and real Exchange Rate are positively signed, and both are statistically significant at 0.4 per cent and 0.5 per cent respectively. This demonstrates the implications of energy sub-sector to business development.

When Gross Domestic Product (GDP) is regressed with Balance of Payment (BOP), the coefficient of the constant term is positive and statistically significant at 0.02 per cent, implying that the energy sub-sector facilitates business development which in turn results in improved business growth. The Durbin-Watson equation is 2.13692 and it's greater than the Adjusted R-square (R^2) of 0.811783 signifying that there is no case for auto-correlation in the model. These further explain that the equation is a good fit. Implying that energy sub-sector is a boaster to business development resulting to business growth.

5. Discussion of Findings

The hypotheses presented in chapter one of the study which is to determine the extent to which energy supply affects the manufacturing sub-sector of south eastern zone Nigeria is tested using t-statistic. From the regression analysis Table 3 at 5 per cent level of significant confirmed that energy supply is statistically insignificant at t-calculated value of -2.52305 and is less than the tabulated value of 1.7207. In view of this, the null hypothesis was rejected while the alternate is accepted which implies that there is significant effect of energy supply on manufacturing sub-sector. This is line with Moyo (2012) and Akuru et al. (2011) in their result of the study on the impact of power disruptions on firm productivity in the manufacturing sector of Nigeria. Faridula (2011 and Magazzion (2011) in Malaysia revealed also that energy insufficiency and disruptions have significant effect in manufacturing and all productive sectors of the economy.

The regression analysis of the influence of energy generation relative to installed capacity on business Growth (GDP) is tested using t-statistic. From the regression analysis Table 4 at 5 per cent level of significant confirmed that business growth (GDP) is statistically insignificant at t-calculated value of –0.171697 is less than the tabulated value of 3.00. In view of this the null hypothesis was accepted while the alternate is rejected which implies that the Business Growth (Proceed GDP) has not been optimized/pronounced due to energy supply inadequacies. This is in line with Fisher, Gutierrez and Serra (2003) study of the effect of the energy sector reform of the economy of Chile on the efficiency of businesses. Kaseke and Hosking (2013) also undertook a study on the relationship between energy consumption and Gross Domestic Product in South Africa.

6. Summary of Findings

- The first objective was regressed Energy supply to Manufacturing, Industrial Production, Technology, Labour productivity and other business. The regression shows a functional relationship between the energy supply and manufacturing sub-sector.
- The second objective reveals that energy supply has influences on business growth meaningfully when regressed in Gross Domestic Product (GDP); it also implies that increase in business development in relation to energy generation/supply contributes to enhanced business growth.

7. Conclusion and Recommendations

Satisfactory energy supply encourages Export of goods and services which subsequently result in better business growth situation. Import and Export are significant to business growth, implying that business growth would be facilitated by satisfactory energy supply, which would also encourage export of goods and services.

- That Federal Government should provide two or more functional power stations in the South Eastern zone, and alternative sources of adequate energy infrastructure, liberalize them for more reliable and efficient energy supply that would continuously support the manufacturing, industrial productions/outputs of the South Eastern zone.
- There should be energy efficiency policies in the area of power generation, and provision of electricity in all critical sectors of the economy that would ensure Business Growth, that would promote export of goods and services.

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