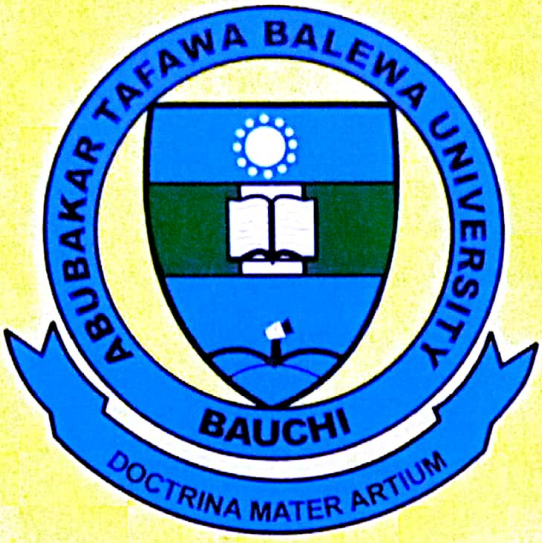

ATBU JOURNAL OF SCIENCE TECHNOLOGY AND EDUCATION (JOSTE)

VOLUME 3 ISSUE 3
AUGUST, 2015

ISSN: 2277-0011

A Publication of the Faculty of Technology Education
Abubakar Tafawa Balewa University,
P.M.B. 0248, Bauchi,
Bauchi State - Nigeria

TECHNOLOGY APPROACH TO ELECTRICAL ENERGY MANAGEMENT IN SMALL AND MEDIUM ENTERPRISES IN NIGER STATE, NIGERIA

By

*Saba, T. M, **Tsado J., *Bukar, B. and ***Bello, H.

*Industrial and Technology Education Department

**Electrical and Electronics Engineering Department

*** Department of Vocational and Technology Education,

Federal University of Technology, Minna, Niger State

***Abubakar Tafawa Balewa University Bauchi, Bauchi State

E-mail; mosessaba@futminna.edu.ng

ABSTRACT

The study investigated technology approach to electrical energy management in small and medium enterprises (SMEs) in Niger State, Nigeria. The design of the study was a cross sectional survey. The target population of the study was made up of 574 technical staff (365 private health centres/hospitals, 138 hotels/guest houses, and 71 woodwork industries) that are connected to the distribution network in 25 Local Governments in Niger State. The sample for the study consisted of 288 respondents drawn through Multistage Sampling Techniques. Two research questions and one hypothesis were formulated to guide the study. The instrument used for data collection was a structured questionnaire. Statistical Package for Social Sciences (SPSS version 19) was used for data analysis. Mean and Standard Deviation were used to answer the research questions, while z-test was used to test the hypothesis. The finding of the study shows that, SMEs in Niger State uses electrical energy efficiently in washing machines and split air conditioning. However, they used fluorescent lamp with electronic ballast, dimmer switches and occupancy sensors at a medium extent, while, occupancy sensors to cut off air-conditioner in unoccupied room and Automatic day light dimming were used at low extent. Electrical equipment/appliances maintenance practices that were rarely adopted are; regular checking of power factor and correction of power factor. Based on the findings of this study, the following recommendations were made: Technical staff of SMEs should cultivate positive maintenance culture towards electrical equipment, appliances and devices and SMEs owners should invest more on efficient technology devices in other to reduce the rate of electrical energy usage in SMEs.

KEY WORDS: Technology Approach, Electrical energy, Energy management, Maintenance culture and Small and Medium Enterprises.

INTRODUCTION

Energy is the capacity or ability to do work (Anyakoha, 2010). Electrical energy is an essential ingredient to mankind. Proper electrical energy management practices reduce energy wastages. The need for energy conservation and efficiency in energy use is becoming evident especially at these times that the cost of energy is greatly increasing. for instance, Aduba (2012) reported that, if Nigerians are using 10 million incandescent 60W bulbs per hour, the nation

will be consuming 600 megawatts per hour, but if these 60W incandescent bulbs were changed to 5.20W Light Emitting Diodes (LEDs), the nation will be consuming 52MW This signifies that, 548MW will be saved and used in some other areas without necessarily building another power plants. Gupta (2010) and Eluwa and Siong (2013) agreed that the technology necessary for electrical energy management practices can be classified into the use of more efficient technology and maintenance of equipment, appliances, devices and machines.

Maintenance is the process of restoring equipment and machines to normal condition or working order by either cleaning or replacement of the machine parts. Maintenance plays significant role in an electrical energy management. It helps equipment or machines to function properly, thereby reducing the excess energy needed to operate an equipment, machines or appliances. In SMEs, where electrical machines are used, there is the need to maintain high power factor through regular power factor correction Karlen and Benya (2004) and (Gupta, 2010). Electrical energy management practices are required in SMEs because of its influences in company profitability and competitiveness.

According to (Central Bank of Nigeria (CBN), 2003), Small scale industries are industries whose total cost is above 1 million naira, working capital inclusive, but land exclusive, the total cost is not above 40 million naira and the number of labour force between 11 and 35. While, Medium scale industries are defined as industries whose total cost is above 40 million naira, working capital inclusive, but land exclusive and the cost is not above 150 million naira, and have the number of labour force between 36 and 100. SMEs have been generally accepted as essential components of national growth and development in developed and developing economies (Aigboduwa & Disamaje, 2013).

USAID (2007), acknowledged that SMEs make up over 90% of the business in the world and it account for over 50-60% of worldwide employment. SMEs help the developing nations in the area of economic growth and the key to successful poverty alleviation activities.

It is also noted that SMEs in Nigeria are performing much less than the expectation which is due to challenges that beset SMEs, among other challenges is epileptic power supply (Fatai, 2011). While, Tribune in Ukuku (2012) lamented that manufacturers spend about ₦1.8 billion on diesel weekly and this had led to eventually folding of most of these enterprises in Nigeria. The main driver for SMEs is electricity; the improvement in electrical energy may lead to reduce cost, making a business more efficient and hence more competitive. SMEs that practice energy management system has a competitive advantage over the one that doesn't. In other to prevent high cost of electricity from showing danger to the proper functioning of SMEs, the management of SMEs needs to engage in good electrical energy management practices. Conserving energy in SMEs does not mean the service or utilities must be cutback or cutout in order to save energy. It simply means that the same degree of utility is achieved with less energy through a series of prudent actions and choices. The SMEs used in this study are hotel/guest houses, Private hospital/health centers and wood industries.

A hotel is a business institution providing meals, lodging and other visitor services. Generally, to be called a hotel, an enterprise must have at least six letting bedrooms, with a minimum of three suite private bathroom facilities. Hotel plays a very important role in tourism industry as a main provider of services to tourists and great generator of income and employment opportunities (Bohdanowicz, Churie-Kallhauge & Martinac, 2001); Hotels consume very large amounts of electricity on daily bases. These include those used for heating, refrigeration, lighting

and other electricity consuming activities. There is need for hotel to become more competitive by cutting down on their energy bills. This implies the introduction of a wider use of energy saving measures. Hotel guests, many of who are paying high amount of money for a home-away-from-home, such guest should not be denied the convenience and comfort he or she needed in their lodging, they may likely leave the room without worrying whether the lights or air-condition are still on. Reducing the cost of electricity while continuing to meet the diverse requirements of customers can be challenging but this is the challenge that is worth taking. Some of the benefits that can be gained through the improvement of electrical energy use in hotels according to Fedrizzi and Rogers, 2002 and EIA (2011) are as follows: Attracting and retaining dedicated staff; Reduction in the use of electrical energy resource and thereby reduced costs; the public image will be enhanced and attract customers and Improvement of competitiveness in the world markets.

Hospitals are institutions or enterprise that care for sick or the injured and are usually put into use twenty four hours per day, all year round. The sick or injured admitted in hospital suppose to enjoy 24 hours power supply uninterrupted. The hospital has many rooms and offices that require reliable power supply and that contributed to high bills for electricity and fuels. The development of new types of equipment, new regulations, new energy-saving technologies and the ageing of the building itself should be an issue of great concern when choosing electrical energy-saving measures which can be used in hospitals and to reduce cost of energy usage. In practice, energy efficiency is an increasingly important requirement, but medical considerations remain the top priority (USAID, 2007).

Woodwork industries can be defined in this work as a place or shop where wood is being processed from conversion to production of wooden materials using high power machines for operation (Porter and Rose, 2006). Wood processing and furniture industry is an important industry in Nigeria, having significant impact on economic development of the nation. The types of equipment use in wood industries include; crosscutting machines, hand feed circular saw machines, dimension saw, panel saws, planning machines, band saw machines, mortising machines, grinding machines and others. These machines perform several functions which are very important to wood worker (Okwori, Johnson, Osesanmi, Aluko, Akponome, Amagon, Dashen & Finangwai, 2006). Wood working machines tools are power driven tools that utilize electricity for their operations.

Investigation of electrical energy management practices adopted in both residential buildings and SMEs becomes crucial in order to mitigate electrical energy crises in Niger State and Nigeria in general (Ubi, Effiom, Okon & Oduneka, 2012). An increase in electrical energy efficiency and conservation refers to a decrease in the ratio of electricity usage over the level of service provision and this can be justified by these reasons: Electrical energy efficiency goes hand in hand with economic efficiency, higher energy requirements usually drive trade balance deficits up and energy production is considered a major driver of environmental degradation, for instance by significantly contributing to climate change and resource depletion and escalating adverse effects on human welfare, especially due to airborne pollution. All these have serious implications to service providers, environment, electricity users in residential buildings and SMEs, Niger State government and the country at large. The enormous potential benefits derived from proper electrical energy management practices prompted the need for this work.

Purpose of the Study

The main purpose of this study was to investigate technology approach to electrical energy management in SMEs in Niger State. Specifically this study would determine:

1. The extent of usage of technological devices for improving electrical energy efficiency in SMEs in Niger State.
2. The maintenance practices of electrical equipment/appliances as adopted for the improvement of electrical energy efficiency in SMEs in Niger State.

Research Questions

The following research questions were formulated to guide the study:

1. What is the extent of usage of technological devices for improving electrical energy efficiency in SMEs in Niger State?
2. At what level are the maintenance practices of electrical equipment/appliances adopted for the improvement of electrical energy efficiency in SMEs in Niger State?

Hypothesis

The following null hypothesis was tested at 0.05 level of significance:

H_{01}: There is no significant difference between the mean responses of technical staff of SMEs on technology approach to electrical energy management practices adopted in SMEs in Niger State, Nigeria ($P<.05$).

METHODOLOGY

This study adopted a cross sectional survey design. This design enables the researcher to describe the attitudes, opinions, behaviours or characteristic of the population based on data collected from a representative sample of the users of electricity about their practices of electrical energy management. The study was carried out in Niger State, Nigeria. Niger State has 25 local government areas and divided into three geo - political zones namely, Zone A. B and C. Niger State power supply is epileptic for operating electrical equipment/appliances in residential buildings despite the fact that the state housed three hydro- electric generation stations, hence the choice of Niger State as the area of study.

The target population of the study was made up of 574 technical staff (365 private health centres/hospitals, 138 hotels/guest houses, and 71 woodwork industries) that are connected to the distribution network in 25 Local Governments of Niger State. The sample for the study consisted of 288 respondents drawn through Multistage Sampling Techniques. The instrument used for data collection is a structured questionnaire. SPSS version 19 was used for the data analysis. Mean and Standard Deviation were used to answer the research questions. While, Z-test was used to test the hypothesis at ($P < .05$) level of significance. The decisions for the research questions were based on the resulting means score interpreted relative to the concept of real lower and upper limits of numbers as shown in Table 1.

Table 1: Five Point Scale

S/N	Scale of R.Q 1	Scale of R.Q 2,	Point
1.	Very High Extent	Very High Adopted	3.50 – 4.00
2.	High Extent	Highly Adopted	2.50 – 3.49
3.	Medium Extent	Rarely Adopted	1.50 – 2.49
4.	Low Extent	Not Adopted	0.50 – 1.49

5.	No Opinion	No Opinion	0.00 – 0.49

Research Question 1

Table 2: SMEs Technical Staff Mean Opinions on the Extent of Usage of Technology Devices for Improving Electrical Energy Efficiency in SMEs in Niger State, Nigeria.

S/No	ITEM	$\bar{X}_1$	$\bar{X}_2$	$\bar{X}_{av}$	SD	RMK
1	Compact fluorescents lamps (CFLs)	3.04	3.22	3.13	0.74	HE
2	Light Emitting Diodes (LEDs)	2.67	3.53	3.10	0.74	HE
3	Fluorescent Lamp with electronic ballast	1.45	2.39	1.92	0.56	ME
4	High pressure sodium lamps (HPS)	2.39	2.57	2.48	0.75	ME
5	Low pressure sodium lamps	2.53	2.55	2.54	0.70	HE
6	Occupancy sensors such as; Motion sensors, Infrared sensors and others	1.50	2.06	1.78	0.54	ME
7	Dimmer switches	1.85	1.79	1.82	0.77	ME
8	Task lighting	1.82	1.62	1.72	0.61	ME
9	Programmable timers	1.51	1.61	1.56	0.65	ME
10	Automatic day light dimming	1.48	1.44	1.46	0.71	LE
11	Split air conditioners	3.09	3.37	3.23	0.60	HE
12	Occupancy sensors to cut off air- conditioner in unoccupied room.	1.39	1.47	1.43	0.52	LE
13	Energy efficient refrigerators	3.12	3.48	3.30	1.11	HE
14	Energy efficient washing machines	2.64	2.66	2.65	1.01	HE
15	Electronic equipment with energy saving mode	2.72	2.80	2.76	1.03	HE
	GRAND MEAN	**2.21**	**2.44**	**2.32**		**ME**

LE= Low Extent, ME= Medium Extent. HE= High Extent

Table 2 shows that, respondents utilized the technology devices in items 1, 2, 5, 11, 13, 14 and 15 to high extent for improving electrical energy efficiency with means ranges from 2.54 to 3.30. Items 3, 4, 5, 6, 7, 8 and 9 with mean values ranges from 1.56 to 2.48 signify that the respondents utilized those technology devices to a medium extent. The respondents use technology devices in items 10 and 12 with means of 1.46 and 1.43 which signified low extent usage of technology devices for improving electrical energy efficiency in SMEs. The grand mean of the SMEs suggested that, technology devices were used to a medium extent. The 15 items had their standard deviation ranged from 0.57 - 1.07 each of these values was less than 1.96 indicating that the respondents were not too far from their mean responses. This adds value to the reliability of the mean.

Research Question 2

Table 3: SMEs Technical Staff Mean Opinions on the Level of Maintenance Practices of Electrical Equipment/Appliances Adopted for the Improvement of Electrical Energy Efficiency in SMEs in Niger State, Nigeria.

S/No	ITEM	$\bar{X}_1$	$\bar{X}_2$	$\bar{X}_{av}$	S D	RMK
1	Cleaning of lights tubes	2.52	2.60	2.56	0.64	HA
2	Cleaning of lights fixtures	2.54	2.68	2.61	1.07	HA
3	Disconnection of ballast from fixtures that bulbs have been removed or faulty.	2.51	3.05	2.78	1.04	HA
4	Putting lamps where necessary	2.60	2.76	2.68	0.58	HA
5	Removing lamps that are not necessary	2.86	2.82	2.84	0.78	HA
6	Improvement on lighting control	2.61	2.67	2.64	0.60	HA
7	Cleaning of condenser coils	2.78	2.38	2.58	0.78	HA
8	Freeing of compressor from dust	2.64	2.68	2.66	0.71	HA
9	Defrost of freezing compartment.	2.59	2.57	2.58	0.69	HA
10	Cleaning of inside compartment.	2.74	2.66	2.70	0.85	HA
11	Proper position of refrigerator on the floor	3.35	3.13	3.24	0.95	HA
12	Sealing the duck of refrigerator properly	2.68	2.74	2.71	0.70	HA
13	Cleaning of A.C filter.	2.96	2.68	2.82	0.68	HA
14	Positioning of A.C in a shaded area.	3.30	3.66	3.48	0.87	HA
15	Checking of vents for adequate air circulation.	2.53	2.55	2.54	0.59	HA
16	Checking of thermostat for proper adjustment.	2.57	2.65	2.61	0.76	HA
17	Regular Lubrication of motor and blower bearing.	2.59	2.51	2.55	0.72	HA
18	Cleaning the liquid and substances on cooker plate.	3.51	3.75	3.63	0.96	VHA
19	Cleaning of electric iron plate	3.40	3.78	3.59	0.98	VHA
20	Monitoring of control unit of cooker.	2.54	2.62	2.58	0.74	HA
21	Checking the effectiveness of thermostat in electric iron.	2.60	2.62	2.61	0.96	HA
22	Cleaning of toaster heating plate	2.69	2.75	2.72	0.75	HA
23	Cleaning of oven/ micro oven plate.	2.79	2.67	2.73	0.76	HA
24	Ensuring seal of oven door is well tight.	2.41	2.27	2.34	0.59	RA
25	Regular lubrication of rotating parts.	2.49	2.51	2.50	0.61	HA
26	Provision of adequate ventilation to motor	2.51	2.45	2.48	1.09	RA
27	Regular shaping of cutting edge of equipment	2.50	2.54	2.52	0.75	HA
28	Regular cleaning of machine	2.34	2.42	2.38	0.68	RA
29	Checking of power factor constantly	2.41	2.21	2.31	0.86	RA
30	Correction of power factor	2.09	2.13	2.11	0.91	RA
31	Use of capacitor banks to improve power factor	1.89	2.29	2.09	0.94	RA
32	Installation of improved bearing of bearing and housing	2.35	2.11	2.23	0.77	RA
33	Regular inspection of motor for wear and tear	2.40	2.44	2.42	0.91	RA

34	Usage of variable speed drives	2.41	2.35	2.38	0.78	RA
35	Regular checking of proper alignment of the motor	2.43	2.37	2.40	1.01	RA
	GRAND MEAN	**2.63**	**2.66**	**2.65**		**HA**

HA = Highly Adopted; RA = Rarely Adopted

Table 3 indicated that, out of the 35 items on the level in which electrical equipment/ appliances maintenance practices are adopted for electrical energy efficiency in SMEs in Niger State, Nigeria, items 18 and 19 were very highly adopted with mean responses of 3.63 and 3.59. Items 24, 26, 28 to 35 have been considered rarely adopted with means ranges from 2.09 to 2.48, while other items were highly adopted. The grand mean of the total respondents is 2.65 indicating that, the respondents highly adopted electrical equipment/ appliances maintenance practices for electrical energy efficiency in SMEs in Niger State, Nigeria. The 35 items had their standard deviation ranged from 0.58 - 1.09 each of these values was less than 1.96 indicating that the respondents were not too far from the mean and were close to one another in their responses. This adds value to the reliability of the mean

Hypothesis One

Table 4: Z- test of Difference between the Mean Scores of Small and Medium Enterprises on technology approach to Electrical Energy Management Practices in Niger State.

Enterprises	Mean	S.D	N	df	Z	Sig (2 tailed)
Small	2.45	0.53	128	229	-1.62	0.13
Medium	2.57	0.64	103			

The result of analysis presented in Table 4: indicated that there is no significant difference in the mean scores of respondents from small enterprises (mean and standard deviations are 2.45 and 0.53 respectively) and medium enterprises (mean and standard deviations are 2.57 and 0.64 respectively) on electrical energy management practices in SMEs; Z (229) = -1.62, P = 0.13. The result indicated that small enterprises practices of technology approach to electrical energy management similar to medium enterprises in Niger State Nigeria.

MAJOR FINDINGS OF THE STUDY

The following findings emerged from the study based on the data collected and analyzed:

1. Respondents view revealed that, the following technological devices are used in high extent; electrical energy efficient washing machines, electronic equipment with energy saving mode and split air conditioning. However, they used fluorescent lamp with electronic ballast, dimmer switches and occupancy sensors at a medium extent, while, occupancy sensors to cut off air- conditioner in unoccupied room and Automatic day light dimming were used at low extent.
2. Electrical equipment/appliances maintenance practices are very highly adopted by respondents; cleaning of the

liquid and substances on cooker plate and cleaning of electrical iron plate. However, they rarely adopted regular checking of power factor and correction of power factor.

3. There was no significant difference between the mean responses of SMEs operators on electrical energy management practices adopted in SMEs in Niger State, Nigeria.

DISCUSSION OF FINDINGS

The data presented in Table 2 provided answer to research question one. The findings revealed that people uses efficient washing machine and electronic equipment with energy saving mode to a high extent. These are in agreement with the work of Eluwa and Siong (2013) who found out that most washing machine and electronic products in circulation in Nigeria are efficient as they don't consume much of electricity. This is signified that most of the washing machines in the markets are efficient; thus, help in reducing the wastages associated to the use of technological devices. This is because used washing machine is not common in the market, so people that opted for washing machine usually go for a brand washing machine which is energy efficient. The findings further revealed the use of split air conditioning and compact fluorescent lamps (CFLs) were in high extent. The findings also revealed that people used fluorescent lamp with electronic ballast, dimmer switches and occupancy sensors at a low extent. The findings were in harmony with the works of (Ubi, Effiom, Okon & Oduneka, 2012) as they observed that efficient lighting and control systems are used at low extent in most of residents and commercial enterprises in Nigeria. This is not far from the truth, as most people are not aware of these devices as energy saving devices or their income level hindered them from using the devices. Also, Karlen and Benya (2004) observed that, passive infrared motion sensors and dimmer switches can reduce energy consumption by 30% or more by automatically switching off lights and air-conditioning, thus saving energy when the guest is out of the room.

The answer to research question two is presented in Table 3. The findings shows that respondents highly adopted these maintenance practices: positioning of refrigerator in the shaded area, cleaning of the liquid or substances on cooker plate and cleaning of electric iron plate. Highly adoptions of these practices were in-lined with the work of Oyedepo (2012) who maintain that many Nigerians formed the habit of cleaning cooker and electric iron plate. He further reiterated that maintenance plays an important role in an electrical energy management. In support of the finding Bureau of Energy Efficiency (2005) and CREDC (2009) suggested regular cleaning of appliances, proper ventilation and positioning of appliances. They further said that adequate ventilation and cleaning of appliances/equipment can help despite the heat which usually leads to excessive loss reduction. The findings revealed that, people rarely adopted practices of electrical equipment/ appliance maintenance such as; regular checking of power factor and correction of power factor with capacitor banks. Proper maintenance practices lead to lower power consumption by the equipment and machines and variably low cost of energy used. Higher power factor in equipment means that the rate at which equipment is doing the work is at high efficiency and low power factor mean the rate at which equipment is doing the work is at low efficiency and the low power factor increases the cost of energy because more power will be needed to operate the equipment/ machine. So regular checking of power factor and correction is very necessary to avoid excessive power usage. Rarely adoption of power factor correction measures is great lost to the power systems. When power factor is not corrected the power providers must provide the non- working reactive power in addition to the working

active power. This resulted in the usage of larger transformer, bus bars, cable and other distribution system devices which otherwise may be unnecessary.

The findings of hypothesis one presented in Table 4, indicated that, there is no significant difference ($P < .05$) in the mean responses of small and medium enterprises in Niger State, Nigeria. The result indicated that, the small and medium enterprises have similar practices towards electrical energy management practices. The finding was in conformity with USAID (2007) and UNDP (2011) as they outlined reasons why SMEs may embrace the principle of electrical energy efficiency; as energy efficiency increases profitability and environmental friendliness. There is economic incentive that induces the SMEs to adopt same practices of electrical energy management.

CONCLUSION

The shortage and wastages of electricity supply from AEDC and its high cost among SMEs in Niger State and Nigeria in general is disheartening and it is drawback the economic and development of the nation. The shortage and wastages is also having negative impact to the environment. In order to find out some of the sources of the wastages of the electrical energy, this study was carried out. Based on the findings of the study, some of the wastages of electrical energy in SMEs are as a result of the facts that: the extent of utilization of technological devices for improving electrical energy efficiency is at medium extent and electrical equipment/appliances maintenance practices for the purpose of ensuring efficient use of electrical energy were highly adopted. It is therefore necessary to create awareness on electrical energy management practices in order to reduce electrical energy wastages associated to poor technology approach to electrical energy management practices in SMEs in Niger State, Nigeria.

RECOMMENDATIONS

Based on the findings of this study, the following recommendations were made:

1. Technical staff of SMEs should cultivate positive maintenance culture towards electrical equipment, appliances and devices. This can be achieved through public enlightenment campaigns on importance of maintenance of electrical equipment, appliances and devices. It will help in reducing electricity wastages due to poor maintenance of electrical equipment, appliances and devices.
2. The users of electric motors and machines in the residences and SMEs should continue to check power factor of motors and machines. If below 0.75 it should be corrected using a capacitor. The extra expenses associated with the use of electric machines and motors with low power factor will be reduced significantly.
3. The SMEs owners should invest more on efficient technology devices in other to reduce the rate of electrical energy usage in SMEs.

REFERENCES

Aduba, O. (2012). Business service- energy report. Guardian Newspaper 29th August, 2012

Aigboduwa, J. E, & Oisamaje, M. D. (2013). Promoting small and medium enterprises in the Nigeria oil and gas industry. *European Scientific Journal* 9(1), 244-250.

Anyakoha M.W. (2010). *New School Physics for Senior Secondary Schools*. Nigeria. Africana First Publishers Limited.

Bureau of Energy Efficiency (2005). Ministry of power, India. Components of an electric motor".

Retrieved on March, 2014 from *www.energymanagertraining.com/equipment all/electric motors/eqp_comp_motors.htm*

Bohdanowicz, P., Churie-Kallhauge, A., & Martinac, I. (2001) Energy-efficiency and conservation in hotels towards sustainable tourism. 4th International Symposium on Asian Pacific Architecture, University of Hawait at Manoa Honolulu Hawail USA 4-7 April

Central Bank of Nigeria. CBN (2003) "Problems and prospects of small and medium – scale industries in Nigeria", (CBN) Publication No 4: 2003.

CREDC (2009). Energy efficiency survey in Nigeria: A guide for developing policy and legislation. Retrieved from *www.credcentre.org.*

Eluwa, S. E., & Siong, H. C. (2013). The impact of psychological and socio-economic variables on household energy conservation: a case study of Ibadan city, Nigeria. *ARPN Journal of Earth Sciences.* 2 (3)

Energy Information Administration. (2011). Residential energy consumption survey. Retrieved from *http://www.eia.doe.gov /consumption /residential/reports/*

Fatai, A. (2011). Small and medium scale enterprises in Nigeria: The problems and prospects. Retrieved from *www.academia.edu/.../small*

Fedrizzi, R & Rogers, J. (2002). Energy efficiency opportunities the lodging industry. Retrieved from *www.getf.org*

Gupta, B. R. (2010). *Generation of electrical energy.* Ram Nagar, New Delhi: Eurasia Publishing House (PVT.) LTD

Karlen, M & Benya J. R (2004) *Lighting design basics.* Hoboken, New Jersey, John Wiley & Sons, Inc

Okwori, R.O., Johnson, E.H., Osesanmi, J.B., Aluko, E.K., Akponome, A., Amagon, M.I., Dashen, P. &

Finangwai, H. (2006). *Theory and practice of vocational-Technical education: basic issues.* Jos, Akins Press and Services.

Osotimehin, K.O., Jegede, C.A., Akinlabi, B.H., & Olajide, O.T. (2012). An evaluation of the challenges and prospects of micro and small scale enterprises development in Nigeria. *American International Journal of Contemporary Research, 2 (4), 174-185*

Oyedepo, S.O (2012). Energy efficiency and conservation measures: tools for sustainable energy development in Nigeria. *International Journal of Energy Engineering IJEE, 2(3), 86-98*

Porter, B & Rose, R (2006). *Carpentry and joinery bench and site skills.* Norfolk, Biddles Ltd.

Ubi, P.S., Effiom, L., Okon, E.O., & Oduneka, A.E., (2012). An econometric analysis of the determinants of electricity supply in Nigeria. *International Journal of Business Administration* 3 (4), 72-82

Ukuku, O.E., (2012). An analysis of the awareness level of Nigerian SMEs owners on available financial options and the role of FDI in financing SMEs. Retrieved from www.masteriped.com/.../Dissertation%200gbonna%20Ebe% 20Ukuku.p

UNDP (2011). Promoting energy efficiency in residential and public sectors in Nigeria. Retrieved from *www.ng.undp.org/energy*

USAID (2007). Small and medium enterprise. Retrieved from www.energyandsecurity.com/./3.SmallandMediumEnterprise.pdf