

## **Techniques for Enhancing Electrical Energy Management in Residential Buildings, Small and Medium Enterprises in Niger State, Nigeria**

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**Abstract:** *The study adopted cross sectional survey research design. The population of the study was 191,990 and this was made up of 191,416 heads of households in residential buildings and 574 technical Staff of small and medium enterprises (SMEs) that are connected to the distribution network in Niger State. The sample for the study consisted of 1,578 subjects. 1,290 heads of households in residential buildings, 288 registered SMEs were drawn through Multistage Sampling Techniques. Two research questions and two null hypotheses were formulated and tested at 0.05 level of significance. 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 Levene's test Statistic, one-way Analysis of Variance (ANOVA) were used to test the to test different hypotheses at ( $P < 0.05$ ). The finding of the study shows the need to promote awareness on electrical energy management practices through public enlightenment campaigns, cultivate positive maintenance culture towards electrical equipment, appliances and devices. Based on these findings, the following recommendations were made: Electricity Management Board in collaboration with Energy Commission of Nigeria and Center for Energy Efficiency and Conservation should jointly organize public enlightenment campaigns to promote electrical energy management practices, the residential electrical energy users and technical staff of SMEs should cultivate electrical equipment, appliances and devices maintenance culture and Government should retrofit homes by replacing incandescent bulbs with energy saving bulbs of lower.*

**Keywords:** *Buildings, Electrical, Energy, Management, Residential*

### **Introduction**

Electrical energy is derived from the flow of electrical charges, and is commonly referred to as electricity. Electricity is used for several applications such as lighting, heating, cooling and operation of electrical machines. It is generally accepted as an essential commodity for biological lives, as it improves the standards of living and facilitates economic development and poverty reduction (Nnaji, 2011; Ubi, Effiom, Okon&Oduneka, 2012). Electricity is derived from electrical power system, which consists of three main hierarchical systems; Generation, Transmission and Distribution Systems. The basic objectives of any electrical power system is to provide adequate and stable electricity to consumers in the most economical and safety manner. Niger State receives electrical power through Abuja Electricity Distribution Company (AEDC) (Awosope, 2014). AEDC have the mission to promote and ensure an investor-friendly industry and efficient market structure to meet the needs of Nigeria for safe, adequate, reliable and affordable electricity. The attainment of this mission depends on the adoption of proper electrical energy management practices by the customers.

Electrical energy management practices can be defined as a judicious and effective use of electrical energy to maximize profits and minimize costs, thereby enhancing competitive position in a global economy (Capehart, Turner & Kennedy, 2005). Electrical energy management practice plays an important role in every industry. In Nigeria and specifically in Niger State, residential buildings and SMEs constitute the largest percentage of electrical energy users. They are responsible for a significant amount of total greenhouse gas emissions (The NEED Project, 2015). It was further noted that, about 15–20% of energy-related CO<sub>2</sub> emissions emitted from residential buildings and SMEs is expected to keep rising.

Small scale enterprises 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 enterprises refers to 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 (Central Bank of Nigeria

(CBN), 2003). SMEs have been generally accepted as essential components of national growth and development in developed and developing economies (Aigboduwa&Oisamaje, 2013). Electrical energy management practices are required in SMEs because of the influences in company profitability and competitiveness. Its proper management reduces production costs and environmental degradation. Awareness of electrical energy conservation and efficiency is an all-important element of electrical energy management practices.

Awareness connotes having knowledge or realizing something. Lack of knowledge or awareness is always the key barrier for energy inefficiency (Wai, 2009; Hussaini & Abdul-Majid, 2014). Awareness help in changing the altitude and it encourage the users of electricity to seek out ways to save electricity. Hussaini & Abdul-Majid, (2014) further noted that, lack of awareness is also visible in several area of operation, such as idleness of equipment, leaving electric lights on when it is day lights, overlooking compressed air leaks and other area of negligence. Oyedepo (2012) and Sanyaolu (2013) averred that public are not well inform about the benefit of electrical energy management and that may have led to energy wastages.

Reddy (1991) agreed that implementation of energy efficiency improvement require great effort of the consumers. Involvement of consumers depends on knowing about energy technology, being aware of the efficiency and conservation approaches. It is certain that, many users of electricity are quite ignorant of the possibilities of efficient improvement and they are unaware of the cost effectiveness conservation measures (Saba, Tsado, Bukar&Ohize, 2016). Electrical energy awareness is the first step to achieve energy sustainability. Without adequate awareness of energy efficiency and conservation, every effort to promote electrical energy conservation will prove abortive and may lead to energy wastage. Awareness creation is a strong tool of helping people realizes ways electrical energy can be managed. The employers or managers can make the employees aware through the following ways; e-mail, presentation/training, posters, staff meeting, staff news letter, stickers, pay slips and others.

The electricity users may be fully aware of energy efficiency and conservation and the benefits accrue from the use of efficient electrical equipment, it does not follow that consumer of electricity will make the necessary investment on the devices or equipment (Reddy, 1991). He further said this is

because quite often efficient electrical equipment is usually higher in initial cost as compare to inefficient ones. Based on this significant numbers of people are low incomes earners, they may prefer going for low cost equipment, even if it is inefficient. Oyedepo (2012) lamented that, Nigerian market is usually full with all kinds of second-hand equipment/ appliances and more than 90 percent of Nigerians use one second-hand product or the other. This is as a result of cheap in prize of second-appliances as compare to the new ones. Human behaviour towards electrical energy usage plays an important role in electrical energy conservation.

Behaviour in any situation according to Trandis theory of interpersonal behaviour is the function partly of the intention, partly of the habitual responses and partly on the situation constraints and condition (Banberg& Schmidt, 2003). UNDP (2011) lamented on attitude and habits of electrical energy users towards energy waste in Nigeria. It is a fact that a lot of energy is wasted in Nigeria because residential, commercial shops, government and private offices and SMEs are using more energy than what is actually required for necessary needs (CREDC, 2009). It is also glaring to see household, commercial and institutions leaving their outdoor light on during the day time, this is evidence of wrong behaviour exhibited by energy users (CREDC, 2009).

Workers were found of wasting energy in their work place owing to the fact that they are not paying for the energy. People usually switch on their air condition and leave the door or window open, such behaviour amount to energy wasted. Several approach revealed successful criterion to increase electricity savings is to focus on behaviour change (Zografakis, Menegaki&Tsagarakis, 2008). Muhieldeen, Adam, Salleh, Tang, and Wong (2008) advocated the need of positive change of behaviour when using energy to avoid waste. A study conducted by Muhieldeen, *et al*(2008) in Malaysia revealed that poor student's behaviour towards electrical energy management contributes significantly to energy wastage. They further said that significant energy saving can be achieved if the management of university can positively change the behaviour of students towards energy conservation. Electrical energy wastages occurs due faulty or lack of energy meter in residents and SMEs.

It is common to see some residential buildings without meter and power providers bill them under estimated billing system. When residents know that they are on estimated bill, they deliberately waste electricity by consuming more energy that is not

paid for. CREDC (2009) observed that the metering system in operation in Nigeria is not good and it does not give way for user of electricity to manage electricity. Analogue meter that have been installed for more than 20 years have not been maintained and frictional effect may possibly affect the meter reading.

Electrical energy efficiency has become the strong mover of economic growth and sustainable development in several countries in the world. When electrical energy is use efficiently, it will provide several benefits such as; the family will not spend so much on settling energy bill, it help the country to reduce the building of electrical power stations, electrical energy will be available for others to use and with good management of electricity in residential and SMEs, the problem of energy sharing will be reduced (Saba, Tsado, Bukar& Bello, 2015). For effective energy management retrofitting homes become necessary.

Retrofitting homes is a technique of electrical energy management, it is necessary for government to retrofit homes and public buildings. The service is now practice world-wide to reduce energy consumption. Owing to the fact that many Nigerian's are poor and they may not afford to change their incandescent bulbs with energy efficiency bulbs due to the cost of energy efficient bulb in the market. Aduba (2012) cited the case of Ghanaians that discovered that they are short of power supply and need to build another power station which might cost them much money and about 3 years to complete. The government decided to replace 6 million 60W incandescent bulbs to LED of 5.2 W, within few months the energy consumption reduce drastically.

He furthered stressed 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 plant. Furthermore, Tsado (2014) pointed out that there are rich chances to save 70% to 90% of energy and cost for running fan, lighting, electric pump systems; 60% in areas such as heating and cooling systems, office electric equipment/appliances and 50% for electric motor through proper adoption electrical energy management practices.

### **Statement of the Problem**

It is sad to observe that, about 30 to 40% of electricity generated is being lost from point of generation to utilization in Nigeria (Tsado, 2014). Even the available electricity capacity is insufficient to meet existing power needs of less than 40% of the people who have access to the national grid (FGN, 2015) Okechukwu (2014) reported that, the then Minister of Power, Prof. Chinedu Nebo, said Nigerians have being wasting over 1,000 Megawatts of electricity generated which amounts to N400bn, these amount of electrical energy can be used for other useful purposes. In other to effectively manage the available electrical power and at avoid energy wastages there is need to enhance electrical energy management practices in residential buildings and SMEs in Niger State, Nigeria.

### **Aim and Objectives of the Study**

The aim of this study was to determine techniques of enhancing electrical energy management in residential buildings and SMEs in Niger State, Nigeria. In specific terms, the objectives of this study were to determine:

1. The barriers to sustainable electrical energy management in residential buildings and SMEs in Niger State, Nigeria.
2. Techniques for enhancing electrical energy management in residential buildings and SMEs in Niger State, Nigeria

### **Hypotheses**

The following null hypotheses were formulated to guide the study and were tested at 0.05 level of significance:

HO<sub>1</sub>: There is no significant difference among the mean responses of residents, SMEs staff on ways of electrical energy management in residential buildings and SMEs in Niger State (P > 0.05).

HO<sub>2</sub>: There is no significant difference among the mean responses of residents and SMEs staff on barriers to sustainable electrical energy management in residential buildings and SMEs in Niger State, Nigeria (P > 0.05).

### **Research Methodology**

This study adopted a cross sectional survey design. This design enables the researchers to describe the opinions 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. Electricity users in Niger State includes residential and SMEs, hence the choice of the area of study.

The population of the study was 191,990 and this was made up of 191,416 heads of households in residential buildings and 574 technical Staff of SMEs that are connected to the distribution network. The sample for the study consisted of 1,578 subjects. 1,290 heads of households in residential buildings, 288 registered SMEs were 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. One - way Analysis of Variance (ANOVA) was used to test hypotheses at (P < 0.05) level of significance. The decisions of research questions were based on the resulting means score interpreted relative to the concept of real limits of numbers as shown in Table 1. Levene's test of homogeneity of variances are carried to test for similarity; in view of the fact that one of the assumptions of the One-way ANOVA is that the variances of the groups are similar. If the significant value is greater than 0.05, then there is homogeneity of variances and the assumption of homogeneity of variances is met. However, if the Levene's F statistic is significant and less than 0.05, then there are no similar variances and it is necessary to refer to the tests of equality of means table instead of the ANOVA table.

**Table 1**  
**Four Point Rating Scale**

S/N	Scale	Point		
1	Strongly Agreed	3.50	-	4.00
2	Agreed	2.50	-	3.49
3	Disagreed	1.50	-	2.49
4	Strongly Disagreed	0.50	-	1.49

**Research Question 1**

**Table 2**  
**Residents and SMEs Technical Staff Mean Opinions on techniques for enhancing Electrical Energy Management in Residential Building and SME's in Niger State, Nigeria.**

S/No	ITEM	Mean	S. D	Remark
1	Providing awareness on electrical energy management practices, through public enlightenment campaigns, signs and others.	3.5	7	1.02 SA
2	Importation of energy efficient appliances into country.	3.4	3	0.89 A
3	Proper policies and legislation on energy management	3.4	1	0.79 A
4	Regular power supply	3.1	2	1.02 A
5	Subsidizing the cost of energy efficient appliances	3.6	5	1.07 SA
6	Regular reading of meter for actual consumption	3.3	2	0.98 A
7	Regular maintenance of energy meters	3.4	6	0.87 A
8	Proper planning of residential and commercial areas	3.5	1	0.98 SA

9	Increasing of tariff during peak period of energy consumption	2.4	3	1.07 D
10	Government and NGO's supporting researches on energy management	3.0	7	0.98 A
11	Proper enforcement of policies.	3.1	7	0.80 A
12	Ban on importation of incandescent bulbs	3.5	0	0.76 SA
13	Development of positive behaviour among electricity users	3.2	3	0.97 A
14	Government retrofitting homes with energy saving bulbs	3.6	4	0.85 SA
15	Low tariff on electricity	2.2	3	0.68 D
16	Utilization of energy standard and label to show energy consumption information	3.2	3	0.79 A
17	Proper motivation of employees towards energy management practices	3.4	1	1.12 A
18	Proper records on energy consumption	2.6	5	1.09 A
19	Regular maintenance of equipment/appliance	3.4	3	0.86 A
GRAND MEAN		3.2	3	A

SA= Strongly Agreed; A= Agreed; D= Disagreed  
Table 2 indicated the similarities and differences in respondents view on the techniques for improving electrical energy management practices in residential buildings and SMEs in Niger State. The respondents strongly agreed with items 1, 5, 8, 12 and 14 with the mean rating ranging from 3.50 to 3.65. While the respondents agreed with items 2, 3, 4, 6, 7, 10, 11, 13, 16, 17, 18 and 19, having the means ranging from 3.05 to 3.43. But they disagreed with items 9 and 15 having the means of 2.23 and 2.43. The total grand mean of 3.23 indicated that residents and SMEs agreed with the items as techniques that can improve electrical energy management practices in the study area.

The 19 items had their standard deviations ranging from 0.68 to 1.12 which is less than 1.96, showing that the respondents were not too far from the mean and were close to one another in their responses. The closeness of the responses adds value to the reliability of the mean.

**Research Question 2**

**Table 3**  
**Residents and SMEs Technical Staff Mean opinions on Barriers to Sustainable Electrical Energy Management in Residential Buildings and SMEs in Niger State, Nigeria.**

S/No	ITEM	Mean	S. D	Remark
1	Lack of proper awareness on electrical energy management practices	3.6	5	0.66 SA
2	No proper policies and legislation on energy management practices	3.3	1	0.59 A
3	Regular power out age	3.5	6	0.60 SA
4	Low income level of electricity users	2.0	6	0.65 D
5	Lack of energy meter in some residences	3.4	6	0.67 A
6	Irregular reading of meter	3.5	8	0.76 SA
7	Improper planning of residential and commercial areas	3.0	5	0.86 A
8	Inefficient metering system	3.2	3	0.79 A
9	Inadequate research on energy management practices	3.3	2	0.78 A
10	Inability of enforced policies on energy management practices.	3.1	3	0.87 A
11	Importation of secondhand appliances into the country	3.4	5	0.77 A
12	Negative behaviour of electricity users	3.0	8	0.89 A
13	Inability of government to retrofit homes with bulbs	2.4	6	0.88 D
14	Low tariff on electricity	2.0	6	0.76 D
15	Low concern of energy management by employers and manager	3.0	1	0.98 A
16	Lack of employee motivation on energy management practices	3.2	0	0.85 A
17	Lack of proper records on energy consumption	3.0	3	0.79 A
18	Inadequate maintenance of equipment/ appliances	3.2	7	0.93 A
GRAND MEAN		3.1	1	A

SA= Strongly Agreed; A= Agreed; D= Disagreed  
Table 2 shows the similarities and differences of respondents on barriers to sustainable electrical energy management practices in residential buildings and SMEs in Niger State. The respondents strongly agreed with items 1, 3 and 6 with mean scores ranging from 3.56 to 3.65. The respondents agreed with items 2, 5, 7, 8, 9, 10, 11, 12, 15, 16, 17 and 18 with mean scores ranging from 3.01 to 3.46. They disagreed with items 4, 13 and 14, with mean scores of 2.06 to 2.46. The total grand mean of 3.11

indicated that residents and SMEs agreed with the items as barriers to sustainable electrical energy management in the study area. The standard deviations ranged from a highest of 0.98 to a lowest of 0.59 which shows that the respondents mean responses do not differ significantly. The 18 items had their standard deviations less than 1.96, showing that the respondents were not too far from the mean and were close to one another in their responses. The closeness of the responses adds value to the reliability of the mean.

**Hypothesis One**

Table 4 revealed the Levene's statistics which has a significant value of 0.36. Then, since the value is higher than the significant level value of ( $P < 0.05$ ), the assumption of homogeneity of variances is met. Therefore ANOVA can be used for analysis. The result of the one-way ANOVA of mean responses of respondents on the barriers to sustainable electrical energy management practices adopted in Niger State is presented in Table 5.

**Table 4**  
**Test of Homogeneity of Variances**

Levene Statistic	df <sub>1</sub>	df <sub>2</sub>	Sig.
1.036	2	1216	0.355

**Table 5**  
**One-way ANOVA of Mean Scores of Respondents on Barriers to Sustainable Electrical Energy Management Practices Adopted in Niger State Nigeria**

Source	Sum of Square	df	Mean Square	F	Sig.
Between Group	0.02	2	0.01	2.40	0.16
Within Group	6.20	1216	0.01		
Total	6.22	1218			

The result of analysis as presented in Table 7 indicated that there was no significant difference ( $P < 0.05$ ) in the mean scores of the respondents. The data supported the hypothesis,  $F(2, 1216) = 2.40, P = 0.16$ .

**Hypothesis Two**

Table 6 revealed the Levene's statistics which has a significant value of 0.71. Then, since the value is higher than the significant level value of ( $P < 0.05$ ), the assumption of homogeneity of variances is met. Therefore, ANOVA can be used for analysis. The result of the one-way ANOVA of mean responses of respondents on techniques for improving electrical energy management practices adopted in Niger State is presented in Table 7.

**Table 6**  
**Test of Homogeneity of Variances**

Levene Statistic	df <sub>1</sub>	df <sub>2</sub>	Sig.
0.342	2	1216	0.710

**Table 7**  
**One-way ANOVA of Mean Scores of Respondents on techniques of enhancing Electrical Energy Management Practices Adopted in Niger State.**

Source	Sum of Square	df	Mean Square	F	Sig.
Between Group	0.02	2	0.02	1.41	0.14
Within Group	6.07	1216	0.01		
Total	6.09	1218			

The analysis of result presented in Table 7, revealed that there was no significant difference ( $P < 0.05$ ) in the mean scores of the respondents. The data supported the hypothesis,  $F(2, 1216) = 1.41, P = 0.14$ .

**Findings**

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

1. The barriers to sustainable electrical energy management practices in residential buildings and SMEs in Niger State, Nigeria include; lack of proper awareness of electrical energy management practices, regular power outage, irregular reading of meter, and lack of employees' motivation on electrical energy management practices and improper planning of residential and commercial areas.
2. Electrical energy management practices in residential buildings and SMEs in Niger State, Nigeria include: promoting awareness on electrical energy management practices through public enlightenment campaigns, subsidizing the cost of electrical energy efficient appliances/ equipment, proper planning of residential and commercial areas, ban on importation of incandescent bulbs and proper policies and legislations on electrical energy management practice.
3. There was no significant difference ( $P < 0.05$ ) in the mean scores of the respondents on barriers to electrical energy management practices adopted in Niger State.
4. There was no significant difference ( $P < 0.05$ ) in the mean scores of the respondents on techniques of enhancing electrical energy management practices adopted in Niger State.

## **Discussion of Findings**

The findings indicated the barriers to electrical energy management practices such as; lack of proper awareness of electrical energy management practices. This implies that there is no proper information or knowledge of electrical energy management practices on the part of electricity users which might have led to energy wastages by residents and SMEs.

These findings were in agreement with the work of Oyedepo (2012) said that, many Nigerians are not familiar with the term energy efficiency and conservation, as lack of awareness is always the key barrier to energy efficiency. The findings were also supported study conducted by UNEP (2006) agreed that, lack of awareness of energy efficiency among the managers of companies and industries are the biggest barrier to energy management practices. Without the commitment on the part of managers, it will be an uphill battle to improve energy efficiency and it may appear to be the root of other barriers. If the management of SMEs and householder are not well informed about energy efficiency and conservation, they cannot be serious towards energy management (Steg, 2008).

Regular power outage was a barrier to electrical energy management practices. Because of regular power outage people usually forget to put off their lights and appliances. The finding was in harmony with the study conducted by CREDC (2009), which they observed that, one of the important factors that negate the development of electrical energy efficiency is regular power outage. They further said that, the respondents emphasized that there is no need to manage what is not regularly available. The findings show irregular reading and lack of meter in some residential buildings and SMEs. When people know that they are placed on estimated billing systems, they use to waste electricity. Oyedepo (2012) observed those analogue meters that have been installed for more than 20 years have not been maintained and frictional effect may possibly affect meter reading. The metering system does not give room for electricity users to pay for energy consumed and it is a serious challenge to efficient use of electricity.

There were negative behaviour of electricity users towards the usage of electrical energy in residential buildings and SMEs. The negative behaviour was a barrier affecting electrical energy management practices. Trendis theory of interpersonal behaviour developed in 1977 sees behaviour as function partly of the intention, partly of the habitual responses and partly on the situation constraints and condition, so

electricity users' negative behaviour is as a result of their intention. The findings of hypothesis one presented in Table 5 revealed that, there was no significant difference ( $P \leq 0.05$ ) in the mean responses of residents and SMEs on barriers to sustainable electrical energy management practices in residential buildings and SMEs in Niger State, Nigeria. The agreement in their mean responses indicated that, these are barriers to sustainable electrical energy management practices. The findings were also agreed with the study conducted by UNDP (2011), CREDC (2009) and Oyedepo (2012), which stated that challenges facing electrical energy management practices are enormous such as lack of awareness, negative behaviour of electricity consumers, regular power outage and others.

The findings revealed that, there is a need to promote awareness on electrical energy management practices through public enlightenment campaign and using other means of disseminating information among electricity consumers. It is worth to note that awareness creation is a strong tool for helping people realize ways electrical energy can be managed. The wastage of electricity can be reduced significantly if people are aware of electrical energy management practices. The finding agreed with the works of Wong (1997), Hein and Jacobsen (2001) and Unachukwu (2010) which stressed that, raising energy awareness is very important in energy management, as awareness is a seed of tomorrow change. Sanstal and Howarth (1994) also agreed with the finding and emphasized that consumer awareness of electrical energy management practices help to reduce potential energy wastages.

Incandescent bulb converts only 10% of the electricity used to produce light and the remaining 90% is used to produce heat. This makes the bulb to be inefficient as it consumed more of electricity. The finding is in consonance with the work of CREDC (2009), which opined that, lack of policy and legislation to address the inefficient use of electricity is a strong drawback to the development of electrical energy management. The finding of the study indicated that there should be proper planning of residential and commercial areas. Doing this will help in proper electrical load distribution network and management. Many cities and emerging towns are not well planned as one can see industrial activities being carried out in residential areas. The finding conformed to the works of CREDC (2009), UNDP (2011) and Oyedepo (2012) as they also recommended proper planning of residential and commercial areas.

The findings on hypothesis two presented in Table 5 revealed that, there was no significant difference ( $P < .05$ ) in the mean responses of residents and SMEs on techniques for improving electrical energy management practices. The agreement in their mean responses signified that, these findings are techniques for improving electrical energy management practices in residential and SMEs. When these techniques are apply in residential buildings and SMEs, electrical energy will be improved and the crisis in the electrical energy sector will be a thing of the past. The findings were consonance with the work of Harrington and Damnic (2004), Wong (1997), as they pointed out some of the strategies for improving electrical energy, such as; promoting awareness among electrical energy consumers, retrofitting homes with energy saving bulbs, regular maintenance of appliances and other techniques.

### Conclusion

The shortage and wastages of electricity supply from AEDC and its high cost among residents and SMEs in Niger State and Nigeria in general is disheartening and it is drawback to the economic and development of the nation. The shortage and wastages is also having negative impact to the environment. Proper energy management in the part of energy users and providers can increase the nation electrical power, thereby reduce the use of generators in residential and SMEs.

### Recommendations

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

1. Electricity Management Board in collaboration with Energy Commission and Center for Energy Efficiency and Conservation should organize public enlightenment campaigns for electricity users in Niger State on the use of efficient technology devices.
2. Ministry of Power and Environment should advise government to retrofit homes by removing incandescent bulbs and replace them with energy saving bulbs of low wattages. This will reduce electrical energy consumption drastically and it will help government to postpone the building of power stations, which will in turn make the environment to be friendly.
3. Policy and lawmaker with a sense of urgency should formulate policies and laws that will help in changing human behaviour. The policies and laws should

also prohibit the importation of inefficient electric bulbs and appliances. The policy and law on electrical energy management practices will help to reduce electrical wastages significantly. As people will be conscious of the policies and laws on wastages of electricity.

4. The employers and managers of SMEs should motivate their employees on positive practices toward electrical energy management in the workplace. They can be motivated through awareness raising, training and giving them responsibility on electrical energy management. Through these, electrical energy used in the workplace will be reduced, thereby reducing the cost of electricity.

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