

Integrating Energy Efficiency Program for Sustainable Power Availability in the Nigerian Energy Sector

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Abstract- Energy efficiency program is a program that is capable of reducing energy waste and saving cost. All Nations in the world are striving for sustainability mostly in the energy sector. Nigeria, one of the third world countries is not left out in this struggle for sustainable power. The challenges in this sector is yearning for attention from power planners that will develop a strategic plan aimed at matching demand and supply power. It is a fact that, energy saving could yield the same results as creating additional kilowatt. Therefore, this paper looks at the different ways of using energy efficiently and proposing same as a model for efficient use of energy. It is strongly believed that, energy management from the end-user's end will seriously reduce energy wastage; reduced energy loss and conserve energy without compromise to consumer's comfort. The model developed here can also serve as a guide to strengthen regulatory measures to enforce the use of energy more efficiently in Nigeria. The paper also identifies commercially and behaviorally ways of reducing energy consumption in the residential, commercial and public sectors. If the energy efficiency program is practiced in Nigeria, then, 30 % of cost in energy would have been saved annually. But, the study reveals that 75 % of consumers don't have any knowledge as regards efficient use of energy.

Keywords: *Efficient Use Of Energy, Demand Side Management, Energy Saving Energy Audit.*

I. INTRODUCTION

Due to the sharp increase in electricity tariff in Nigeria with the reason of meeting the huge cost of generation, transmission and distribution of power to the end user, there is no gainsaying that energy should be used wisely and efficiently. Demand side energy management concept calls for the wisdom, for the fact that, the energy in supply is grossly inadequate. Nigeria with a population of about one hundred and seventy (170) million is still battling with power availability of 6000MW power as against an estimated power demand of 50,000MW, [10]. Due to this inadequacy of supply, the consequence is load shedding, overloading, unnecessary faults etc., [11-14]. There is evidence of potential sites for renewable energy, which could have been harnessed to improve electric power generation, [15-17]. Enough sun everywhere, hydro sites in the South-South and middle belt, enough wind in the North, biogas everywhere. There is need for energy consumers of all status to manage the available energy wisely for sustainability.

II. BEHAVIOURAL APPROACH OF ENERGY USAGE IN NIGERIA

One of the ways to tackle the inefficient use of energy is to change the pattern energy is Wasted in Nigeria because households, public and private offices and industries use more Energy than is actually necessary to fulfill their needs. One of the reasons is that they use old And inefficient equipment and production processes. The other reason, which I want to discuss are unwholesome practices that lead to energy wastage. These practices include:-

A. Use of Incandescent Light Bulbs

The common name for incandescent bulb in Nigeria is the "yellow bulb" because of the yellowish color of the light rays from the bulbs. This particular incandescent lamp produces heat due to the energy it consumes and causes discomfort at night. From the study carried out, 65% of our respondents claim they use incandescent bulbs (Figure 1.1). The use of incandescent bulbs for lighting is energy intensive. Only about 5% of total energy used by an incandescent bulb is converted light energy, the remaining 95% is converted to heat energy [1]. The energy rating of the incandescent bulbs found in the Nigerian market range from 40W to 200W or above. Findings revealed that in many places where people experience low voltages, people purchase the 100W and 200W in order to get a brighter effect. Also, some use it for outdoor lighting because they appear brighter. People use this because the energy saving bulbs are expensive as compared to the incandescent lamps the cost of energy saving bulb in the Nigerian market ranges between N800 to N1000. However, some substandard energy saving bulbs could be purchase for about N200. On the other hand, the prices of incandescent bulbs range from N30 to N100.

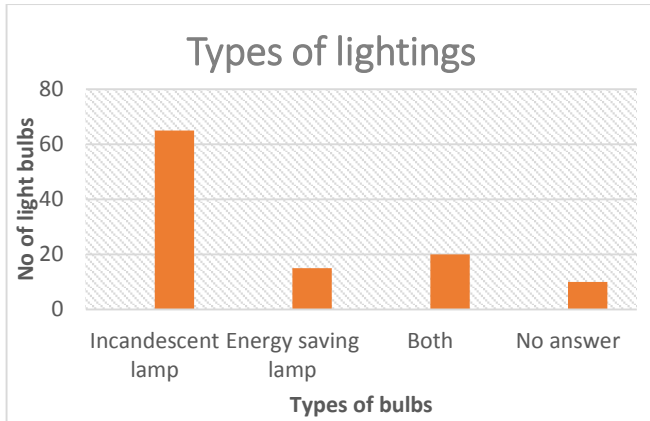


Figure 1.1 types of light bulbs use by respondents.

Energy consumption can be drastically reduced if Nigerians start using energy saving lamps. For instance if a household that was using 10 incandescent bulbs of 100W each ($10 \times 100w = 1000w/h$) decides to use 18W of energy saving lamp ($18W \times 10 = 180w/h$), he will save about 82% of electricity just for lighting point.

B. The use of lightings to advertise goods displayed outside

Many shops and fast food vendors always put on light in the day to advertise their good and most the vendors visited used incandescent bulbs, which was not necessary. Other household visited shows that all their outside light were on during the day this is common in commercial areas, this was one of the major course of energy inefficiency in Nigeria. Even in public institutions such as universities, government establishment and ministries were also found to have their outdoor lighting switched on during the day. Many respondents blame the Power Holding Company of Nigeria (PHCN) for this behavior. According to them, when there is always power outage during the dark hours of the night and it lingers into the day, they forget to put off their outdoor lighting. A lot of energy can be saved if Nigerians cultivate the habit of putting off their outdoor lighting in the day time. Energy saved from using the natural light instead of light bulbs during the day can be made available for use in offices and for industrial activities. This singular act can save up to 30% of the energy used.

C. Increase in private borehole and lack of centralized heating system in Nigeria

In major cities in Nigeria, many people now have boreholes in their houses. This is due to the inability of government to provide water in many parts of the country. The use of privately owned boreholes is on the increase. The machine for pumping water is an energy intensive machine and can consume up to 2000W of electricity. Apart from consuming a lot of energy, these machines exert a lot of stress on PHCN facilities. The use of heating equipment for cooking and heating water should be discouraged in the residential and private buildings. Government should encourage the use of solar heaters. Heating equipment consume about 60% of the energy used in houses. In places like hotels where several water heating equipment are installed in several rooms sometime numbering up to 100 rooms or more, the use of solar heaters in these buildings will help to save a lot of energy. In many parts

of the world, water is conveyed from a central system through network of pipes to residential, public and private buildings, also there don't have a centralized water heating system so people sort to use ring boiler or electric kettle or jug for boiling of water, also the use of solar Heater to boil water can go a long way to reduce energy wastage, if the government will provide the people with central water heating system and a public water supply system it will go a long way to minimize energy wastage.

D. improper planned cities

Many cities in Nigeria are not properly planned. The practice of building industries in residential areas is unhealthy for power supply design for residential use. With this kind of practice, utilities providing electricity are not able to plan on how to allocate energy to the various sectors. More also, because of the high energy consumption of the equipment used in the industries, the equipment exert so much stress on the PHCN facilities which were initially installed to serve residential areas. In this kind of system, it is difficult to properly manage and monitor or allocate energy for the two sectors in a way to maximally satisfy everybody. Government on their part should properly planned cities for easier schedule of power distribution to industrial areas and residential buildings.

E. The use of energy efficient buildings

Energy efficient buildings are designed in a way that ensures energy is used at a reduced cost, and in a sustainable and conserved manner. Energy efficient building is a panacea to attaining a "sustainable city or eco-city". Eco-cities are designed to achieve maximum comfort by occupants with emphasis on reduced energy inputs, water and food, waste output of heat, and reduced air, noise and water pollution [6]. Houses should be built in a way that will allow ventilation for free passage of air natural light, it should have enough windows especially in offices and institution of learning, this will reduce drastically the use of bulbs and cooling systems due the nature of the building. Energy efficient building is relatively unknown in Nigeria due to certain factors which include: ignorance/illiteracy, poverty, lack of awareness and/or poor Government policies toward achieving such concepts in buildings.

F. Factors influencing consumer's choice of appliance

A customer choice of appliance to use or buy is an integral part that determine the energy consumption of appliance this will help the consumer to make appropriate choices of the type of equipment or appliances to buy that will help him save energy and in turn save money when paying his electricity bills. When purchasing any appliance, there are so many things consumers consider. A better understanding of these factors could help to make policy to promote energy efficiency. Government can take advantage of these factors to develop policy that will promote energy efficiency, some of the factors identified during the study are listed below:

1. Beauty of the appliances
2. The price of the appliance
3. The manufacturer's name
4. The price of the appliance

5. Durability
6. The need for the appliance
7. Efficiency of the appliance
8. Maintenance cost/ease of repair
9. Consumer rating
10. Quality of the appliance
11. Performance output
12. Provision of warranty

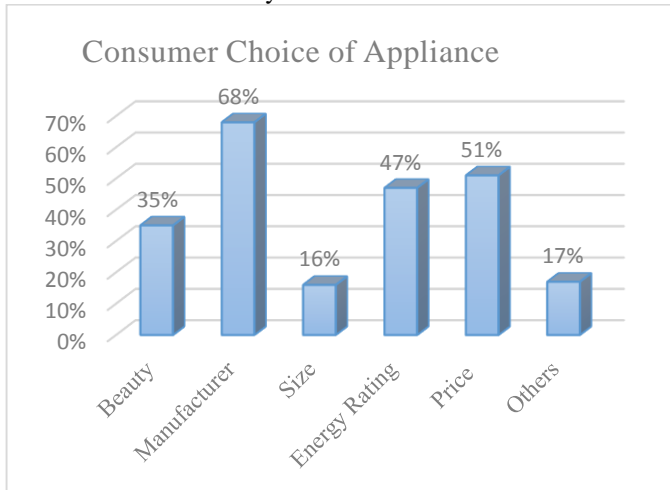


Figure 1.3 consumer's choice of appliance

Minimum Energy Performance Standard (MEPS): Minimum Energy Performance Standards (MEPS) is also referred to as “standards” or “Efficiency standards” in some countries. MEPS are specified minimum energy efficiency Levels products must meet before they can be legally sold in any country [2]. Here, specific energy standards are set before products are allowed into a country and sold, the product must be tested to prove its energy performance if it meets the minimum energy performance standard. Secondly, ensure the product comply with the requirement set by that particular country which include energy labelling requirement. Thirdly, thirdly the product must be registered for proper monitoring. For example a country may decide to set a standard that refrigerators consuming more than 400kwh will not be allowed into the country. MEPS are mandatory standards and are done in a manner that they balance technical possibility with economic viability and the competitive force within a particular market. The government should enforce standards and label such as dial and bar label [2] like other countries like Australia and Korea.

G. Lack of awareness on energy Audit and management.

Study from 100 household in Nigeria revealed that about 76% of Nigerians claimed that they do not know how to carry out energy audit in their homes and offices (Fig. 1.2). Although many of our respondents are familiar with the term “energy efficiency”, some seem not to fully understand what it entails. They were not able to correctly define the concept. This may suggest why many customers were not checking their appliances for energy label before buying them. Access to electricity is a problem in Nigeria, 99% of respondents do not get electricity supply for up to 10 hours a day. This is another important factor that may affect the development of energy efficiency. “You are asking us to save energy; we do not even have the energy to save”. This is one

of the comments received during a focused group discussion. Respondents are on the opinion that when the energy is made available, then they will endeavor to save energy. Awareness creation and enlightenment campaign is needed to erase this notion from the minds of Nigerians.

H. Energy use in Nigeria

Nigeria has a broad base and abundance of fuel sources: hydro, natural gas, coal, solar, wind and geothermal. However the use of these fuel sources has been largely skewed in favour of hydro power and crude oil, leaving the other sources either untouched or poorly harnessed. Nigeria gas reserve as at 2001 was about 163 trillion standard cubic feet and about 50% of the gas produced are flared on daily basis, if these is well harnessed it can be used to run most of our thermal plants which are generating below capacity due to lack of the supply of gas to run the turbine.[8] It has been established that fossil fuels accounts for 94% of exports from Nigeria in 2006 with only a small fraction of this available for domestic use and about 40% of households connected to the national electricity grid [4]. Thus, the GHGs (Greenhouse Gas) associated to fossil fuel consumption in such areas will be likely higher thereby increasing the risk of global warming and climate change. Greenhouse gases are also produced from other sources either natural (combustion, respiration) or artificial (deforestation and other human activities). A large percentage of Nigeria’s populace relies on fuel wood for cooking [5]. Which then makes the environment largely polluted with greenhouse gases such as carbon (iv) oxide and carbon (ii) oxide. The housing sector accounts for a reasonable quota of materials and energy that lead to greenhouse gases. The United Nations Environmental programme (UNEP) sustainable construction and Building Initiative (SCBI) noted that 30-40% of the global energy use comes from the housing sector. This implies that use of energy efficient buildings will offset the greenhouse gases (CO₂, CO, CH₄) by 30-40% which could have emanated from the housing sector thereby saving our climate from the negative effect of these gases.

111. CONCLUSION

Energy efficiency and management cannot be over emphasised in Nigeria since the energy generated is not enough due to high demand for energy therefore adequate steps should be put in place by individuals and government for effective management of energy which include the use of energy saving bulbs, adopting energy efficient buildings, always put off the light or appliance when not in use. Government in their own part should encourage the importation and production of energy saving to discourage incandescent bulbs, discourage the importation of substandard appliances to the country also customers from all rink and files be it government or individual should be made to pay electricity bill this will encourage them to manage energy efficiently.

RECOMMENDATION

For Nigerians to have effective and efficient energy management system the populace and the government have a role to play and the following recommendation should be adhered to strictly

1. The government should put a ban on the importation and production of incandescent bulbs while policies should be put in place strategy to reduce the cost and encourage the importation and production of energy saving bulbs
2. Occupant of public and private residents should always put off their security light during the day and planning of cities so that industrial and residential areas should be separated to help government to plan how they can efficiently provide electricity for two sectors.
3. People should be accountable for energy they consume both government parastatal or establishment and individual this will help to minimize energy wastage also all government buildings should be metered.
4. Government should create awareness on the advantages of using energy efficient buildings over conventional buildings. This could be done through media, Newspaper, schools, mobile communications. Government should also introduce strong policy on compulsory energy efficient buildings and ensure that every State adhere to such regulations

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