Evaluating the Energy and Carbon (IV) Oxide (CO_2) Reduction Resulting from Efficient Lighting at the University of Lagos, Nigeria

M.O. Babatunde[1], T.O. Akinbulire[1], P.O. Oluseyi[1], M.U. Emezirinwune[1], T.E. Shomefun[2]

Corresponding author Email: peng.unilag@gmail.com

[1]Department of Electrical and Electronic Engineering, University of Lagos, Akoka, Yaba, Lagos, Nigeria

[2]Department of Electrical and Electronic Engineering, Covenant University, Ota, Ogun State

Abstract

This study evaluated the economic and environmental potentials of improving the energy efficiency of the lighting technology at the University of Lagos, Nigeria. The energy audit report for the Faculty of Engineering, University of Lagos before retrofitting shows that all lighting fixtures in the lecture rooms are the 1.2 metre inefficient fluorescent lamps. The cost effectiveness of lighting retrofitting with Compact Fluorescent Lamps (CFL) and Light Emitting Diode tube (LED) lighting technology alternatives for the lighting system at Faculty of Engineering lecture rooms were analysed using economic indices such as life cycle cost analysis, net present cost, simple payback time, and internal rate of return. Relative to the existing system, installation of the two lighting technology alternatives would result in a 40 % and 72 % reduction of consumed energy respectively. With both technology alternatives paying back in less than two years, the LED technology returned a NPV of $35,791.76 (₦12.95M) compared to the $15,261.43 (₦5.24M) given back by the CLF lighting fixtures. If the alternative lighting technology that conserves the most electricity was installed, carbon dioxide emissions accompanying electricity usage would be reduced by about 72 % and a savings of 3.84 tonnes of oil would be achieved annually. From the study, it was established that the utilisation of energy efficient lighting system will reduce energy consumption; increase bills savings; and indirectly reduce carbon (IV) oxide emission from the fossil fuel used in powering the lamps

Keywords: Conservation, Efficiency, Electricity, Emission, Tariff

1.0 INTRODUCTION

CARBON (IV) oxide (CO_2) emission has become a major source of concern while its reduction is of interest to everyone and in every sector of the society. This is due to the negative effects it has precipitated on our global world in terms of global warming and recent trends of health hazards (Anomohanran, 2011). The adoption of energy efficiency and energy conservation techniques are therefore imperative to reducing the emission of greenhouse gases. This necessitates the adoption of energy efficiency and conservation techniques as imperative in mitigating greenhouse gas. Therefore, there is a need to improve on energy usage worldwide.

In developing economies, more than 40 % of the total energy consumed is in reference to the residential and the tertiary sectors, the major part of which are building structures (Perez-Lombard *et al.,* 2008). Consequently, buildings account for about one third of CO_2 emission worldwide (Farrou *et al.,* 2012). This is largely due to the inefficient use of energy in such buildings. Lighting systems consume approximately 30 – 40 % of energy demanded in commercial buildings (Perez-Lombard, Luis and Ortiz Jose, 2008). This conveniently amounts to one third of buildings' electricity bills. However, the use of electricity for lighting purpose worldwide is generally inefficient. Asides the aesthetic value it affords an environment, the lighting system is very important for all building occupants. It illuminates an environment for easy movement; enhance productivity as well as safety during work or other related human activities. The lighting system is,