

SURVEY AND REPLACEMENT OF INCADESCENT LAMPS WITH COMPACT FLUORESCENT LAMPS IN SELECTED ESTATES AND FACILITIES IN ILORIN, KWARA STATE, NIGERIA.

**K. R. Ajao
H. A. Ajimotokan
M. K. Garba
B. F. Sule**

TECHNICAL REPORT

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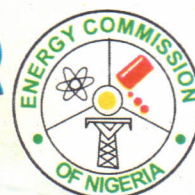
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**NATIONAL CENTRE FOR HYDROPOWER
RESEARCH AND DEVELOPMENT**

ENERGY COMMISSION OF NIGERIA

UNIVERSITY OF ILORIN, ILORIN, NIGERIA.



NOVEMBER, 2010

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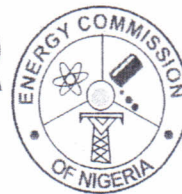
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FOREWORD

The National Centre for Hydropower Research and Development is a research Centre of the Energy Commission of Nigeria situated in the University of Ilorin, Ilorin, Nigeria. It is engaged in research activities which will foster the development and application of hydropower within the diverse energy mix needed for sustainable socio-economic development in Nigeria. In addition, it engages in other energy related functions as may be assigned to it with a view to encouraging efficient use of energy in its immediate environment. The Centre undertook an extensive survey of use of incandescent lamps (ICLs) in selected estates and facilities in Kwara State in 2010. The main aim was to carry out replacements of the ICLs with modern energy efficiency lamps called Compact Fluorescent Lamps (CFLs). This report contains the details of the survey and the retrofitting of the lighting in residential houses with CFLs. The results are quite informative and useful for general planning of lighting systems in residential houses.

The Centre is grateful to the residents' associations of the various estates used for the study. It also acknowledges the donation of CFLs through a joint Cuba – Nigeria agreement under Energy Commission of Nigeria.

Prof. Bolaji F. Sule, *FNSE, FNICE*
Director,
National Centre for Hydropower
Research and development,
University of Ilorin, Ilorin, Nigeria.

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1. INTRODUCTION

1.1 Background

Electricity plays a very vital role in the technological development of every nation. Adequate and reliable electricity is an essential ingredient for socio-economic development and growth of enterprise. Inadequate supply not only restricts socio-economic activities to basic human needs, it limits economic growth and adversely affects quality of life. At present, electric energy utilization in Nigeria is far from being efficient. The potential for efficient energy utilization or conservation is substantial in the two most energy consuming sectors of the economy namely household and industry. In the household sector, there is considerable energy wastage due to the use of traditional incandescent lighting and other energy consuming appliances. Compact Fluorescent Lamps (CFLs) use up to eighty percent (80%) less energy or electricity than incandescent light bulbs, may last up to six (6) times longer, cost little up-front, and provide a quick return on investment. In the household sector, substantial savings can be made by simply retrofitting incandescent bulbs with fluorescent lamps. CFL is fluorescent lighting designed to be used in a normal incandescent light bulb socket. It works like fluorescent bulbs by passing a current through a gas-filled tube. Incandescent light works by heating up a metal filament until it is white-hot. Incandescent bulbs produce mostly heat, which is why a fluorescent using only 13 watts of electricity can produce light comparable to an incandescent hogging 60 watts.

The Energy Commission of Nigeria (ECN) supplied to some states of the federation Compact Fluorescent Lamps (CFLs) for the replacement of incandescent lamps in organized settlements as a pilot project and as part of the Commission's energy-efficient programme. In Kwara state, organized residential estates were selected in Ilorin, the state capital and the University of Ilorin campuses (mini-campus and the permanent site). The preliminary and feedback questionnaires were administered to capture the needed data from the selected sites. These information include the type of building, lightings and their respective wattages, average monthly electricity consumption (kWh), average monthly bill paid (Naira), the Power Holding Company of Nigeria (PHCN) feeder readings, lifespan of installed CFLs, hours of usage per day and reason(s) for failure (if any), beneficiaries responses regarding CFLs' quality ratings and interest in procurement of other energy efficient appliances etc.

During the exercise, a total of twenty seven thousand, four hundred (27,400) CFLs were retrofitted while incandescent bulbs retrieved are to be properly disposed. From these project sites, three months energy consumption (PHCN bills and meter readings) before and after retrofitting with CFLs were collected for data analysis.

The exercise is not without its own challenges; our personnel had to contend with lack of cooperation from some residents who believed that the bulbs replacement exercise is intruding on their privacy among others.

1.2 Review of Energy-Efficient Lighting Programs in other Countries

In the last few decades, energy efficient lighting programs have been carried out worldwide by multilateral agencies, government's agencies, and non-governmental organizations. Many of these programs have been called "market transformation" programs because they attempt to alter the fundamental structure of the lighting marketplace in a particular country or region. As reported by Eric and Nils in their paper - Energy-Efficient Lighting Programs: Experience and Lessons from Eight Countries - published in 1998 in Energy Policy Journal and among these are: Jamaica Demand Side Management (DSM) demonstration project carried out in 1995. This project created a DSM programme unit within the Jamaica Public Service Co (JPSCo) utility. As part of this programme, the utility gave free CFLs to 100 homes (about 300 lamps) to test them and to establish technical criteria regarding equipment performance, customer response, and installation problems. Subsequently, the utility has begun to sell a planned 100,000 CFLs to approximately 30,000 households at discounted prices. The utility sells CFLs to consumers as part of an overall energy savings package along with combinations of other equipment like low-flow showerheads and outdoor lighting controls and also, a substantial public education and information campaign through utility mailings, offices, and the media.

The Brazilian utilities conducted pilot residential lighting programs between 1993-96 as CFLs dissemination programs to research marketing approaches, consumer behavior, etc. Through this programme, the utility improved voltage and current levels in the distribution systems, and thus help all customers obtain more acceptable lighting service levels.

Danish Residential Utility (DSM) CFL quality programs between 1988 and 1994, which has positioned Denmark as the second highest CFL ownership rate in the world (second only to the Netherlands). These programs deployed about 1 million CFLs through a combination of give-away, pay-on-the-bill sales, and (most commonly) sales through rebate coupons. In the later programs, subsidies were lower and finally phased out. Since 1994, Danish CFL programs have moved away from rebate programs towards an increasing focus on quality, testing and labeling.

1.3 Aim and Objectives

The aim of this project is to survey organized, medium-sized residential estates or appropriate facilities that are currently using incandescent lamps and replace same with CFLs with a view of achieving savings in energy consumption.

The specific objectives to achieve this aim are to:

- i. Constitute technical team to execute the survey, implementation and feedback phases
- ii. Ensure that all incandescent lamps are retrofitted and arrange for proper disposal in conjunction with the state environmental protection agency
- iii. Carry out a regular follow-up survey in the project sites
- iv. Collate, analyze and present information of energy consumption data before and after retrofitting: and
- v. Create public awareness on the advantages of CFLs over incandescent lamps and hence arouse public interest in the use of CFLs in residential, commercial and industrial edifices.

1.4 Methodology

The technical committee constituted liaised with Kwara State Ministry of Energy and the Kwara State Property Development Corporation which is directly in charge of the management of the following estates: Mandate I & II, and Mandate III housing estates. Meetings were scheduled with the Residents' Associations of these estates and the team briefed them on the essence of the exercise to be carried out, which they gracefully embraced. Letters were also written to the Residents' Association of the UNILORIN quarters (GRA staff qtrs, senior staff qtrs, and junior staff qtrs) and the management of the University of Ilorin and that of Lower Niger River Basin Development Authority (LNRBDA).

The survey exercise commenced afterwards at the LNRB estate with a five-man technical team and ten (10) ad hoc staff.

The whole exercise in these estates and other facilities was carried out in three (3) phases:

- i. Survey Phase : Questionnaires administered, physical inspection and meter readings
- ii. Implementation Phase: Replacement of incandescent lamps with CFLs
- iii. Feedback Phase: Questionnaires administration and data analysis

APPENDIX III

ENERGY COMMISSION OF NIGERIA

ECOWAS /CUBA /ECN: HIGH QUALITY COMPACT FLUORESCENT LAMPS (CFL) ILORIN PILOT PROJECT

FEEDBACK FROM THE BENEFICIARIES

A: Basic Data

Name of Estate: _____

House Address: _____

Type of Resident: _____

Town/State: _____

Respondent: _____

Tel No: _____

Email Address: _____

B. Lighting Information

1. How many lighting points are in your house? _____
2. How many incandescent Lamps were replaced? _____
3. Were all your incandescent lamps replaced? YES or NO
4. If YES, do you still have any incandescent lamp in your house? YES or NO
5. If YES, why? Tick reason(s) as appropriate:

Reasons for Having Incandescent lamps	✓
CFL installed burnt out	
Was stolen	
Damaged accidentally	
Others (specify)	

6. If answers to number 3 above is NO, why? Tick reason(s) as appropriate:

Reasons for non-replacement of all incandescent lamps	✓
Forgotten	
Not at home	
Lamps finished while replacing	
Others (specify)	

7. How would you rate the quality of the CFLs installed?

Rating of the lamp's quality	✓
Excellent	
Very Good	
Good	
Fair	
Poor	

8. Have you made any attempt to compare the quality of the ECN's CFLs with those in the open market? YES or NO.

9. If YES, please tick your findings as appropriate:

Findings	✓
Far brighter	
Last longer	
Better shaped	
Others (specify)	

10. Have you seen the same brand of the ECN's CFLs in the open market? YES or NO

11. If YES, where? _____ and how much was it sold? _____

12. What is the estimated hours of use per day of the CFLs installed in your apartment? _____

13. What are your electricity billings before and after the replacement?

SN	Month	Electricity Bills	
		Before Replacement	After Replacement
1			
2			
3			
4			
5			

14. How would you rate the illumination (brightness) of the CFLs over incandescent lamps?

Ratings of CFL's illumination	✓
Excellent	
Very Good	
Good	
Fair	
Poor	

15. Have there been any damage or burnt out to /of CFLs replaced in your apartment? YES or NO

16. What advantages of the CFLs have you observed over incandescent bulbs? Tick reason(s) as appropriate:

Advantages observed	✓
Energy Efficiency (Low Energy Consumption)	
Lower Electricity and Lighting Bills	
High Quality Light (Better Lighting)	
Long lasting (Longer Lifespan)	
Less Heat Emission	

17. In the event of damage or burnt out, would you replace the bulbs with CFLs again? YES or NO
18. Since after the replacement, have you bought and installed new electricity consuming appliance(s)? YES or NO
19. If YES, please list them

Energy Efficient Appliances	✓
CFLs	
Fridges	
Energy Efficient Cars	
Others (specify)	

20. Will you recommend for extension of this initiative to other household appliances? YES or NO
21. If YES, mention in other of priority your household appliances that you would want to be more efficient products.

22. Would you recommend for the expansion of this initiative to cover the whole country? YES or NO
23. If YES to question 22, what should government do to achieve this goal, in your own opinion?

24. Will you like this initiative to be extended to other energy appliances in your house? YES or NO.