

**THE ENERGY CONSUMPTION PATTERNS OF AC AND DC
SOURCES OF ENERGY VIEWED FROM THE PERSPECTIVES OF
COST AND EFFICIENCY**

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B.ENG. (ELECTRICAL AND ELECTRONICS ENGINEERING)

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Matric No: 16PCK01388

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ACCEPTANCE

This is to attest that this dissertation is accepted in partial fulfilment of the requirements for the award of the degree of **Master of Engineering (MEng) Degree in Electrical and Electronics Engineering** in the Department of **Electrical and Information Engineering**, College of Engineering, Covenant University, Ota, Nigeria.

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CERTIFICATION

This is to certify that materials recorded in this dissertation titled “The energy consumption patterns of AC and DC sources of energy viewed from the perspectives of cost and efficiency” resulted from original research carried out by OGUNLEYE, Oluwasikemi Gloria (16PCK01388).

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DEDICATION

This dissertation is dedicated to the Almighty God who has always been my strength and help in times of need and all through the course of the research.

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GLOSSARY

AC: Alternating Current

DC: Direct Current

HVDC: High Voltage Direct Current

RE: Renewable Energy

PV: Photovoltaic

RES: Renewable Energy Source

ABSTRACT

Direct Current (DC) cannot be transformed by transformer because its frequency is very close to zero and the ability of Alternating current (AC) to be transformed (because its frequency is not zero) is the reason why Power System Networks are AC designed today. However, since the advent of High Voltage Direct Current (HVDC) transmission and the growing need for energy systems to be green and efficient, DC is crawling back to the scene as DC applications are diverse and holds the promise for efficient power consumption and easy integration of renewable energy. This has brought up an advocacy for a complete change over to DC or a mixed system of AC and DC. This research work investigated what a complete change over to DC would do concerning Electricity poverty in Africa especially Nigeria, rural dwellers' ability to afford this transition and what it would cost the utility by comparing the electrical energy consumption, energy loss, system efficiency and cost of an AC system and DC system. These systems were made up of a hypothetical house in a rural area since they are the most affected by Electricity poverty and because the residential sector has received very little attention in DC transition. Results showed that the DC-House appliances cost is 54.23% more than the AC-House appliances, the AC-House loses 64.07% energy more than the DC-House, the AC-House would pay 71.34% more in energy bills than the DC-House, the AC-House would cost the utility 73.3% more to install than the DC-House and the utility would be paid back faster in the DC-House than in the AC-House.

keywords: renewable energy sources; solar energy; DC; AC; electricity poverty; efficiency; cost.