



**FACULTY OF ENGINEERING AND
TECHNOLOGY**

DEPARTMENT OF ELECTRICAL ENGINEERING

BACHELOR OF SCIENCE IN ELECTRICAL ENGINEERING

FINAL YEAR PROJECT REPORT

**AN INTELLIGENT SWITCHING ALGORITHM BASED ON
DEMAND FORECASTING**

BY

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SUPERVISOR

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This final year project report is submitted to the department of electrical engineering as part of the fulfilment of the requirements for the award of a bachelor's of science in electrical engineering at Busitema university.

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ABSTRACT

The increasing complexity of balancing grid power with renewable energy sources, coupled with rising global energy demand, necessitates innovative intelligent switching algorithms. This project focuses on developing an intelligent switching algorithm that leverages advanced forecasting techniques to optimize energy source utilization, enhance efficiency, and reduce costs. By utilizing an Autoregressive Integrated Moving Average (ARIMA) model, the algorithm accurately predicts energy demand based on historical consumption data.

The proposed algorithm dynamically switches between grid power, and solar energy based on demand forecasts and real-time solar availability. This prioritization of renewable energy minimizes reliance on the grid, reducing operational costs. The algorithm's framework integrates ARIMA with machine learning for improved adaptability and accuracy in managing non-linear demand fluctuations.

Aligned with Uganda's Vision 2040 and global Sustainable Development Goal 7, the project aims to address inefficiencies in existing intelligent switching algorithms, which rely on static and costly grid-dominant models. The outcomes of this project include cost reductions, improved energy efficiency, and a scalable, sustainable framework for optimizing renewable energy integration in Uganda's energy landscape.

DECLARATION

I, the undersigned, declare that this final year project proposal report was developed by, **NDUHURA EDWIN**. I confirm that the work herein is original and represents my collective efforts in research, analysis, and documentation.

Name : **NDUHURA EDWIN**

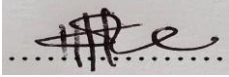
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APPROVAL

This is to certify that this work was done under the supervision of and has been approved for submission to the department of Electrical Engineering at Busitema University.

Supervisor : **DR. MIRONDO GODFREY KIBALYA**

Signature: 

Date: 28/08/2025

DEDICATION

I dedicate this report to my parents, Mr. Twahebwa James and Mrs. Bashabire Joy. They have been pillars of strength throughout our academic journeys and their love, support, and encouragement has kept me going.

ACKNOWLEDGEMENT

I am overwhelmingly thankful to the Almighty God for his protection throughout my academic journey. Special appreciation goes to my supervisor **Dr. Mirondo Godfrey Kibalya** for the guidance and assistance extended towards the completion of my work. I extend my sincere appreciation to my parents for continuously supporting me in this academic journey.

May the Almighty God reward you abundantly.

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LIST OF ACRONYMS

ARIMA - Autoregressive Integrated Moving Average

EAC - East African Community

GA – Genetic Algorithm.

IEA - International Energy Agency

IRENA - International Renewable Energy Agency

LSTM - Long Short-Term Memory

MAPE - Mean Absolute Percentage Error

PACF - Partial Autocorrelation Function

Q-Q - Quantile-Quantile (Plot)

SDG - Sustainable Development Goal

UEGCL - Uganda Electricity Generation Company Limited

UNREEA - Uganda National Renewable Energy and Energy Efficiency Alliance

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