BUSITEMA UNIVERSITY

FACULTY OF ENGINEERING

DEPARTMENT OF COMPUTER ENGINEERING

A WEB-BASED POWER MONITORING AND RECONNECTION SYSTEM FOR A SMART ENERGY GRID

BY

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DECLARATION

I **ENGALU GERALD**, REG NO. BU/UP/2014/301 declare that this project final report is my original work except where explicit citation has been made and has not been published or submitted before to any university or higher institution of learning.

Signature: .....

Date: 4/06/2018.....

APPROVAL

This is to certify that the project under title" ***A web-based power monitoring and re-connection system for a smart energy grid***" has been done under my supervision and is now ready for examination.

Signature .....

Ms. NAKIGANDA AGNES

Department of Computer Engineering

Date: .....

LIST OF ACRONYMS AND ABBREVIATIONS

AVR	Automatic Voltage Regulator
CSS	Cascading Style Sheets.
PHP	Hypertext Preprocessor
REA	Rural Electrification Agency.
RCDs	Residual Current Device switches.
URL	Uniform Resource Locator
SCADA	Supervisory Control And Data Acquisition.
SQL	Structured Query Language

ABSTRACT

Electricity generation and distribution began many centuries ago. The problem of power blackout is still a challenge to many developing countries in the world. Though many measures or methods have been carried out to curb this effect, like the use of automated generators and power monitoring systems, power blackout has still remained a threat.

This power blackout is mainly caused due to Spikes (voltage variations), Transformer failure, Weather and then handling errors.

The purpose (main objective) of this project is to design and develop a web-based power monitoring and reconnection system for a smart energy grid. This system establishes the availability and uninterrupted power supply to the consumers.

Reviewing of literature, observation and consultations are some of the methods that were used to gather data in order to formulate the requirements of the system including functional and non-functional requirements.

The system design uses the custom developed voltage sensors to read the voltages, wherein the microcontroller analyses the data and the grid voltages can be logged in MySQL database, using a PHP script with CSS lines, the web browser displays the MySQL data at auto refresh. The web data is accessible through an HTTP request using an IP address as the URL for the system control.

The system was designed successfully though with some challenges. Testing of the full system performance was hard since the appropriate components for inter-switching were hard to get. More research is required to make it more effective and to use more parameters like current which can enable one detect the LOAD on the grids.

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CHAPTER ONE
INTRODUCTION

1.1 Background.

How to produce, distribute, install, and use electricity and the devices it powers is the culmination of nearly 300 years of research and development.

Efforts to understand, capture, and tame electricity began in the 18th century. For the last 150 years, dozens of "natural scientists" in England, Europe, colonial America, and later the United States analyzed electricity in nature, but producing it outside of nature was another matter.

That didn't happen on any large scale until the late 19th century[1, 2].

The electricity demand globally is expected to increase more than two-thirds by the year of 2035 according to the International Energy Agency[3]. Such increase in electricity demand puts a higher burden on the current outdated and overstressed power infrastructure in Uganda. In addition, it causes serious network congestion problems and degrade the quality of the transferred power. Therefore, there is a discussion on how the existing power distribution grid in Uganda suffers from unreliability due to the lack of efficient monitoring, fault diagnostic, and automation techniques[4].

The term "Smart Grid" refers to a completely modernized electricity delivery system which monitors, protects and optimizes the operation of its interconnected elements from end to end[5]. The system includes a variety of operational and energy measures including smart meters, smart appliances, renewable energy resources, and energy efficient resources. Electronic power conditioning and control of the production and distribution of electricity are important aspects of the smart grid[6, 7].

Supervisory Control and Data Acquisition (SCADA) is the core of decision making in the smart grid. They are used to apply real-time monitoring and control over the power grids. It also enables and helps in managing the power flow throughout the entire network to achieve high reliability[4, 8]. However, the fast growth rate in the technology of SCADA system has not yet been highly embraced in Uganda[9]. Currently most distribution lines are manually monitored after a certain interval of time and cannot reconnect online, this therefore may leave a given area in a power blackout for a long time.

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