BUSITEMA UNIVERSITY

FACULTY OF ENGINEERING

DEPARTMENT OF COMPUTER ENGINEERING

PROJECT REPORT:

TITLE: DOMESTIC POWER THEFT MONITORING SYSTEM

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A Project Report submitted to the Faculty of Engineering in Partial Fulfillment of Requirements for the Award of the Degree of Computer Engineering

JULY 8

DECLARATION

I hereby declare that I carried out the work reported in this project report in the department of Computer engineering, Busitema University, under the supervision of Mr. ARINEITWE JOSHUA.

I solemnly declare that to the best of my knowledge, no part of this report has been submitted to any higher institution for any award. All sources of knowledge used have been duly acknowledged.

Signature……

Date……

MPIIMA JAMIRU
BU/UP/2012/325

APPROVAL

This is to certify that the project report with a titled "DOMESTIC POWER THEFT MONITORING SYSTEM" carried out by MPIIMA JAMIRU has been read and approved for meeting part of the requirements and regulations governing the award of the Bachelor of Computer engineering degree of Busitema University.

Signed: ……

Date: …….

Mr. ARINEITWE JOSHUA
Department of Computer Engineering,
Busitema University

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LIST OF ABBREVIATIONS AND ACRONYMS

DPTMS: Domestic Power Theft Monitoring System

MIPS: Million Instructions Per second

MHz: Megahertz

SRAM: Statically Random Access Memory

USART: Universal Synchronous Asynchronous Receiver Transmitter

RAM: Random Access Memory

ROM: Read Only Memory

EEPROM: Electrically Erasable Programmable Read Only Memory

RC: Resistor-Capacitor

PCB: Printed Circuit Board

CT: Current Transformer

UMEME:

PL: Phase Line

ADC: Analog to Digital Converter

AMR: Automatic Meter Reading

PLC: Power Line Communication

PT: Potential Transformer

GSM: Global System for Mobile Communication

IR: Infra-Red pair

LCD: Liquid Crystal Display

PD: potential difference

ABSTRACT

A domestic power theft monitoring system is the subject system. This is a control system that relies on the algorithm that; monitors the current flowing through the live and neutral wires carrying electric power to the electricity user(s), makes a decision depending on the monitored values of current supplied to the microcontroller, and ensures that the load whose source of power goes through system are not running in the theft suspected mode. This system improves the technology of the existing metering systems in the attempt to reduce or completely curb down the cheating of electric power by looping that is known to be carried out today.

In gathering the information, consultations and document reviews concerning the existing metering systems and their corresponding subsystems responsible for detecting and notifying power theft cases were used.

It was from the analysis of the gathered information that the developing of a domestic power theft monitoring system kicked-off.

I designed the system in Proteus ISIS software and wrote a code in Arduino which provided me with the basic picture on how the system was to work and be integrated from its constituent subparts.

The components of the system were tested prior to system testing using a braid board after which they were soldered on a copper board. The functionality of the system was under the control of the algorithm/code that was written on the microcontroller.

The system was finally subjected to system testing to validate and verify its working by me and some of my other classmates before presenting to Busitema University.

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CHAPTER: ONE

1.1 Background of study

Power transmission and distribution involves many operational losses. These losses can be categorized as technical losses and non-technical losses. Technical losses are losses which occur during transmission and distribution of electric power, since no power system can be perfect in delivering power to the end customer. Technical losses are naturally occurring losses and consist mainly of power dissipation in electrical system components such as transmission lines, power transformers, measurement systems, etc. Non-technical losses refer to losses that are independent of technical losses in the power system and these include non-payment of bills by customers, errors in technical losses computation, errors in accounting and record keeping that distorts technical information. But the most prominent form of non-technical loss is power theft. [1].

Power theft is the major prevailing problem faced by the transmission and Distribution Company in the supply of the electric power in Uganda, power theft causes huge loss to the company and to cover these losses ultimately, power charges are increased which affects different people even these who are not involved. Power theft mainly occurs when the client bypasses the energy meter which takes the readings of the power used. With a technical view, Power theft is a non -ignorable crime and at the same time it directly affects the economy of a nation. Power theft is a social evil, so it has to be completely eliminated. Power consumption and losses have to be closely monitored so that the generated power is utilized in a most efficient manner. Thus there is a need to develop a system which will implement that.

The research shows that, in Uganda the statistical rate of power theft is 24.7% of the generated power and UMEME loses 60 billion shillings Ugandan currency annually [2].

1.2 Problem statement

Currently, there is rampant illegal power consumption which has resulted into increased power charges, huge losses to the company and this is mainly due to ineffective and

inefficient present methods of detecting and preventing Power theft. Power shortage in the country is mainly due to power theft and one of the challenges in stopping power theft, is the difficulty in detecting power theft. In particular it is difficult to find the exact location where power theft is occurring. Measurement of parameters like power line current and power line voltage has not been available in a satisfactory way to optimize power network management.

Thus there is a great need to control this illegal power consumption with a system that can detect power theft, report to the sub-station and disconnects the client.

1.3 Objectives

1.3.1 Main objective

To design and implement a domestic power theft monitoring system.

1.3.2 Specific objectives

The main objective will be achieved through the successive implementation of the following;

i. To conduct a research study on the existing power theft monitoring systems and power theft detection mechanisms currently in place.
ii. To determine requirements for the proposed system.
iii. To analyze requirement, design the proposed system
iv. To develop the system
v. To test and validate the system.

1.4 Justification

Power theft is a great problem to power distribution company. Therefore, the company really requires a system that will monitor power theft without human interfaces; this will be done by controlling power passing through the electrical meter (input and output power) so that power theft at any time can be detected.

The deployment of the system will reduce or completely eliminate power theft. This will be possible by performing automatic switching OFF of the load using a relay at any time in case of power theft detection.

1.5 Scope

This project proposal will focus on the design of power theft monitoring system used in conventional meters with functionality limited to; looping the phase wire entering the meter, illegal opening of the meter, performing automatic switching off the load(s) connected to the other side of the meter and sending an sms to the substation.

The system will be used in single-phase electric power meters, which are used by low power consumer. The system will thus be developed for use by electric power distributors, of which UMEME leads in Uganda.

This project started from September 2015 to May 2016.

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