Faculty of Electrical and Electronic Engineering Technology

DEVELOPMENT OF SMART ENERGY METER WITH LOGGER SYSTEM

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Bachelor of Electrical Engineering Technology (Industrial Power) with Honours

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DEVELOPMENT OF SMART ENERGY METER WITH LOGGER SYSTEM

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in partial fulfillment of the requirements for the degree of
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I declare that this project report entitled Development of Smart Energy Meter with Logger System is the result of my own research except as cited in the references. The project report has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

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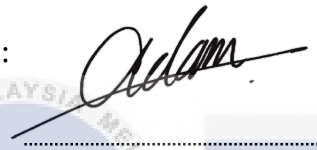
I hereby declare that I have checked this project report and in my opinion, this project report is adequate in terms of scope and quality for the award of the degree of Bachelor of Electrical Engineering Technology with Honours.

Signature : 

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Date : 8/3/2023

DEDICATION

My dissertation honours my family and numerous friends. My dear parents, En. Azali bin Mahat and Pn. Noraini binti Jamali, whose words of encouragement and push for perseverance continue to echo in my ears. My dear brothers and sisters who have never abandoned me.

This dissertation is also dedicated to my many friends and family members who have supported me throughout the process. I will be eternally thankful for everything they have done for me, especially my fellow classmates who have helped me build my technology skills, as well as the many hours of proofreading and technical expertise.

ABSTRACT

A Smart Energy Meter is a developing device in this project that allows monitoring the power consumption of portable appliances, which is a step toward energy conservation programs for any electrical equipment. This project provides a customisable power metre design using voltage and current sensor, ESP32 and Arduino. This metre will measure RMS voltage and current, actual and perceived power, and power factor in real time. A reference power meter calibrates the voltage, current, and actual power. A detailed knowledge of the consumption of each device will allow us to identify the power loss, voltage overload and exceedance or leakage current occurring in the circuit. Similarly, this device will aid in determining when one of them is malfunctioning. A co-design methodology of hardware-software is being used in this prototype

ABSTRAK

Meter Tenaga Pintar ialah peranti yang sedang dibangunkan dalam projek ini yang membolehkan pemantauan penggunaan kuasa peralatan mudah alih, yang merupakan satu langkah ke arah program penjimatan tenaga untuk sebarang peralatan elektrik. Projek ini menyediakan reka bentuk meter kuasa yang boleh disesuaikan menggunakan sensor voltan dan arus, ESP32 dan Arduino. Meter ini akan mengukur voltan dan arus RMS, kuasa sebenar dan dirasakan, dan faktor kuasa dalam masa nyata. Meter kuasa rujukan menentukur voltan, arus dan kuasa sebenar. Pengetahuan terperinci tentang penggunaan setiap peranti akan membolehkan kami mengenal pasti kehilangan kuasa, lebihan voltan dan lebihan atau arus bocor yang berlaku dalam litar. Begitu juga, peranti ini akan membantu dalam menentukan apabila salah satu daripadanya tidak berfungsi. Metodologi reka bentuk bersama perisian perkakasan sedang digunakan dalam prototaip ini.

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In the name of Allah, the Most Gracious, the Most Merciful, I would like to thank God for giving me strength and good health conditions during the final year semester at the Universiti Teknikal Malaysia Melaka campus. Thank God for giving me a good physical and mental to complete this Final Year Project. A successful final year project is a collaborative endeavour. In particular, I express our sincere appreciation to my supervisor, Encik Adam bin Samsudin, for accomplishing the encouragement, guidance, criticism and friendship we have built together this year. We would never have achieved this without our family's loving support. The funds our faculty and family provided to assist us brought all of the materials required to complete the final year project. Thank you to all of my friends who lent a helping hand and to the lecturers who helped me meet the project requirements in various ways. Lastly, I am grateful for having all of you beside me. Thank you very much.

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δ	-	Voltage angle
	-	
	-	
	-	
	-	
	-	
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LIST OF ABBREVIATIONS

V	-	Voltage
A	-	Ampere
W	-	Watt
P	-	Power
	-	
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CHAPTER 1

INTRODUCTION

1.1 Introduction

In this chapter, the discussion started with the background of the study in the country regarding power meter logger and was followed by problem statement explanations. The main objectives of this current study, the scope of the study, the significance of the study and the outline of the thesis also had stated in this chapter.

1.2 Background of Study

Looking from Malaysia's perspective, high technology in electrical appliances is vital in growing Malaysia economically. Besides energy transmission, high technology electrical appliances are the choice that consumers, operators and engineers can shift themselves from the low class to the high class of services. The potential to grow Malaysia into a world class technology implemented is bright. However, the power meter logger services need to step up in plenty of areas. Many complaints from the local maintenance operator about a few aspects of the old power meter functions.

The electrical power meter has been a topic of discussion for lacking of quality standard. The functions of the existing power meter seem reasonable to many but there are loopholes and area to improvise. The quality of material has been doubted. Many complaints

and issues have been voiced out by the operators and consumers such as the accuracies, operations and also the data not being solved.

This study is inspired to help the problem that is facing by the operators of the services in site work operations and industry. Consumers, operators and engineers of all levels suffer from the operations and inefficient service of the electrical power meter. This can be a leading factor in the deterrence of technology in Malaysia. People spend most of their time waiting and wasting because the data readings can be taken at the present time only. Because of that, a logger system was invented to ease everyone who using it by searching the data stored and can be read day by day, also times to times.

For this project, the researcher would like to investigate on factors of the accuracy of the data, components quality and modern monitoring technology in order to develop an electrical power meter logger model. This chapter explains on the problems in the industry regarding to the existing power meter functions and the objectives of the study.

1.3 Problem Statement

The industry has long acknowledged the need of adopting a new technology energy meter model in Malaysia. However, many concerns continue to be afflicted by delays and cost overruns, which are commonly attributed to inadequate operations and maintenance directed towards consumers of various classes with the primary desire of their buildings themselves. The issue must be addressed as a whole, not just by one party. The government plays a critical role in the deployment of these technologies by creating a financially feasible environment that encourages private sector engagement and so avoids the need for public subsidies.

Firstly, the main problems with this power meter logger is the lack of system expertise, especially in Malaysia. Malaysia is a developing country and still does not experience high technology components or methods. This can be surely seen by the amount of expertise itself. Based on the captured information, the method involves capturing information about a sequence of

documents used by the first user on the computer system and associating a plurality of content areas with a plurality of sets of documents in the sequence. The second user is then allowed to choose one of the content areas, and the set of data associated with the chosen content area is provided to the second user, possibly in the same order as the first user browsed the documents. Another goal of the present invention is to enable a wide range of users to benefit from the expertise of experts as expressed through the experts' access and use of programs.

The lacking of required systems such as logger systems and digital program data will contribute to confusion and lack of services quality especially to first time users. Alternatively, the logger programme is a programmable intermediary that is set up to monitor the client application's usage. Web browser intelligence is one example of such an intermediary, as described in Barrett, R., Maglio, P. P., and Kellem, D. C., Proceedings of Human Factors in Computing Systems, CHI '97. (1997).

Cost wise, an electrical appliances facility is much higher than wiring services. Governments would have to spend a significant amount of money to develop and provide the necessary infrastructure and facilities for the electrical appliances industry in any given country. A high-quality logger system can be constructed for an average of (30-80) dollars, whereas a complete power meter logger can easily cost several hundred dollars to be constructed, with additional thousand dollars in capital expenditures required for upgrades and repairs through its lifetime.

Next, the problem that will be looked at is the maintenance quality of the electrical appliances. It compromises many elements of the maintenance service such as wiring, electrical facilities, safety aspects and many more. Lots of issues to touch upon on the aspect of maintenance quality in making it a reliable and world class service. Electrical Installation and Maintenance Practice, according to Croft, Terrel (1915), is a program introduced through practical exercise, the maintenance of electrical systems and circuits, electrical installation inspection and test procedure.

According to the National Board of Technical Education (NBTE), electrical craftsmen are expected to use the manufacturer's manual to test, diagnose, service, install, and completely repair any fault on electrical machines and equipment. According to the NBTE (2004) report, the goal of Electrical Installation and Maintenance practice is to provide training and impart the necessary skills to produce craftsmen, technicians, and other skilled personnel who are enterprising and self-sufficient. The process of making something better than it was before is known as an improvement. An aim to reach the level of service quality of such remains a work in progress with continuous effort to improvise the operations.

1.4 Research Objectives

i. To identify the current practices of power meter logger usage.

ii. To develop the smart energy meter with logger system.

iii. To analyze the factors of cost that generates from the development of this smart meter.

1.5 Scope of Study

In this project, the focus is on the data result of the power meter logger itself. There is some study on how to get a real time location signal or data. Based on chosen component, Arduino MCU esp-32 with a Wi-fi module is the suitable component to use to get real time location data. Besides, the researcher focuses on the improvement of a current electronic power meter as it can ease everyone using it. The current trend of power meter needs an improvement in the long-term form to provide enough and sufficient service to the consumers/operators and function well for the quality of life. This has demanded a good service quality of a logger system. The review of the previous study has played an important role in the improvement and affected the new specification of the power meter needed.

At present, there is no ideal power meter with a logger in the market. Therefore, we researcher has invented a technology to recreate our own electronic power meter to match the building's size thus providing an efficient power supply as needed.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

The study advocated identifying the variables that contribute to data, components, and cost, which will aid in the development of new technologies, hence improving the high quality of power meter loggers. This chapter examines prior or current research or journal articles connected to the issues. Various academics have indicated in prior or present studies that there are several factors that are crucial elements in obtaining the idea.

2.2 Overview

My final year project were focusing on a power meter that has a similar function to the energy meter. But this time, I want to add some function known as a logger.Basically, the energy meter or power meter is used to operate and record the readings at presenttime. This is because, it is difficult for us to get a reading on the past day as we need to take it by ourselves. Thus, by the innovation on the meter, this project is conducted to ease everyone who is willing to get a reading by connecting the micro SD memory data to the software used [1]. The data will show exactly what has been recorded on the meter readings. It was recorded for every second through the microSD card. Overall, I hope this final year project will be a success with some guidance from a supervisor and friends.

2.3 State of The Art

Over the last several decades, there has been an unstoppable trend toward the internationalisation of business, particularly software-intensive high-technology enterprises. Economic forces are continuously transforming national markets into global markets, producing new forms of rivalry and collaboration that transcend national borders. This shift has a significant impact not only on marketing and distribution, but also on how products are conceived, created, built, tested, and delivered to customers. The author discusses how software development is becoming a multisite, multicultural, worldwide distributed endeavour.

Industry 4.0 and Industrial Internet of Things (IIoT) technologies are quickly accelerating data and software-driven digitalization in a variety of industries, most notably industrial automation and electrical power systems [2]. Among the many advantages provided by these technologies is the infrastructure for leveraging big-data, machine learning (ML), and cloud computing software tools, for example, in the building of advanced data analytics platforms. Despite the rising interest in this field, information on the utilization of data analytics in the context of Industry 4.0 is scant in the scientific literature.

2.3.1 Smart Meter

In several countries worldwide, intelligent meters have been introduced since the beginning of the 2000s. The intelligent meter as a key element of the intelligent grid is expected to provide several stakeholders with economic, social and environmental benefits [3]. The actual principles of smart meters have been discussed a lot. The smart meter data evaluation, which deals with data collection, delivery, processing and analysis that benefits all stakeholders, is one of the main factors evaluating the performance of smart meters.