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Design and develop an integrated utility system (Energy Meter) / Mohanraj Letchimenan.

**DESIGN AND DEVELOP AN INTEGRATED
UTILITY SYSTEM (ENERGY METER)**

Mohanraj a/l Letchimenan

Bachelor of Electrical Engineering (Industrial Power)

May 2013

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(ENERGY METER)**

MOHANRAJ A/L LETCHIMENAN

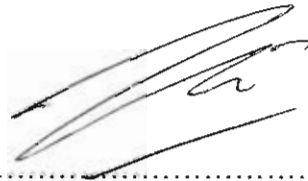
**A report submitted in partial fulfillment of the requirements for
the degree of Bachelor of Electrical Engineering (Industrial Power)**

**Faculty of Electrical Engineering
UNIVERSITI TEKNIKAL MALAYSIA MELAKA**

MAY 2010

"I hereby declare that I have read through this report entitle "Design and Develop an Integrated Utility System (Energy Meter)" and found that it has comply the partial fulfillment for awarding the degree of Bachelor of Electrical Engineering (Industrial Power)"

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EN. MOHD RUZAINI BIN HASHIM

Date

19 JUNE 2013

"I declare that this report entitle "Design and Develop an Integrated Utility System (Water Meter)" is the result of my own research except as cited in the references. The report has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.


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Date : 19 JUNE 2013

Gratitude To My Well Wishers

"I declare that this report entitle "Design and Develop an Integrated Utility System (Water Meter)" is the result of my own research except as cited in the references. The report has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

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Date : 19 JUNE 2013

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ABSTRACT

The intention of establishing this project is a step to further enhance the recently, introduced digital energy meter to enable the consumers to know their power usage in a simpler manner by viewing at the digital screen. Whereby, the meter has the feature to calculate the instantaneous electric bill in ringgit Malaysia and displaying it on the LCD screen connected to it. This creates awareness to the consumers on their daily power usage. This is applicable since the energy meter will measure the power usage by hourly basis to calculate the power in kWh form. This designed energy meter is an integrated system with the water utility system. Before that, enhancement is done to the current water utility system from analog to digital water meter. Communicating both utility systems by using the Wireless device called as XBee enables both system to be integrated. The receiver is connected to the energy meter whereas the transmitter is connected to the digital water meter. The usage of water supply is transmitted using XBee to the energy meter, which will then be sent to the terminal unit. The data transmitted from the energy meter to the terminal unit is sent through a communication protocol called as Power Line Communication (PLC). The mentioned terminal unit function is as a data recorder. Data logging will be done by system in the terminal unit using the LabVIEW software. Whereby, it makes a more systematic way for the utility company staffs to obtain data at one place. This leads to more efficient and systematic way that saves the time and reduces cost of not going to each unit (house) to obtain the required data every month. Besides that, consumer will be aware of their utility usage in a more practical manner.

ABSTRAK

Tujuan membina prototaip projek ini adalah satu langkah untuk meningkatkan kelebihan meter elektrik digital yang diperkenalkan abru-baru ini. Penambakan pada meter elektrik digital ini membolehkan pengguna mengetahui penggunaan tenaga mereka dengan cara yang mudah dengan hanya melihat pada skrin LCD. Tambahan, meter ini yang mempunyai ciri-ciri untuk mengira bil elektrik serta-merta dalam ringgit Malaysia dan memaparkan nilai tersebut pada skrin LCD tersebut. Ini mewujudkan kesedaran kepada pengguna tentang penggunaan tenaga harian mereka. Ini kerana meter elektrik digital ini akan mengukur penggunaan tenaga pada setiap jam untuk mengira kuasa dalam bentuk kWh. Ini meter elektrik digital ini direka untuk menjadikan satu sistem bersepadu dengan sistem utiliti air. Sebelum itu, penambakan dilakukan kepada sistem utiliti air semasa dari meter analog kepada meter air digital. Komunikasi sistem utiliti kedua-dua meter dilakukan dengan menggunakan peranti Wireless dipanggil sebagai XBee membolehkan kedua-dua sistem yang dapat berkomunikasi. Modul XBee penerima (receiver) disambungkan pada meter elektrik digital manakala modul XBee pemancar (transmitter) disambungkan ke meter air digital. Penggunaan bekalan air dihantar menggunakan XBee kepada meter tenaga, yang kemudiannya akan dihantar ke unit terminal. Data yang dihantar dari meter elektrik digital ke unit terminal itu akan dihantar melalui protokol komunikasi dipanggil sebagai Komunikasi Talian Kuasa (PLC). Terminal unit yang disebut berfungsi sebagai pengumpul data. Pengumpulan data akan dilakukan oleh sistem dalam unit terminal tersebut menggunakan perisian LabVIEW. Di mana, ia membina cara yang lebih sistematik untuk kakitangan syarikat utiliti untuk mendapatkan data pada satu tempat. Ini membawa kepada cara yang lebih efisien dan sistematik yang menjimatkan masa dan mengurangkan kos supaya tidak perlu untuk mendapatkan data di setiap unit (rumah) yang diperlukan setiap bulan. Selain itu, pengguna akan sedar penggunaan utiliti mereka dengan cara yang lebih praktikal.

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LIST OF ABBREVIATION

IUS	-	Integrated Utility System
EnWat	-	Energy and Water metering system
SMS	-	Short Messaging System
GSM	-	Global System for Mobile Communication
V	-	Voltage
A	-	Ampere
kWh	-	kilo Watt hour
m ³	-	meter cube
LCD	-	Liquid Crystal Display
VCC	-	Input supply 5V
Gnd	-	Ground
Rx	-	Receiving port
Tx	-	Transmitter port

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CHAPTER 1

INTRODUCTION

Integrating utility services into one single system had been spoken in conceptual methods. Energy and water are both utilities that have the potential to be integrated into one system. The proposed project confines these two utilities into one single system as one of its objective. Improvement in technology has brought the development of equipment towards digitalized era. As can be seen conventional energy meters has been changed from mechanical meters to digitalized energy meter. This indeed poses an impact to both utility company and the consumers. How does it post an impact? Mechanical meters tend to wear off easily as years pass by and the readings become inaccurate. Fixing an electronic meter increases the reliability and the precision of the energy meter and can be used for a longer period of time. As mentioned the project title intended for integration between two utility services in this country that are energy and water utilities. The development of this project is an enhancement of the current digital energy meter integrating with the water meter. To fulfil this requirement, conventional type water meter has to be replaced with a digitalized meter. This is to synchronize the current development towards digitalized era that makes the consumers easier to work with. The integration between both utilities service is done through Wireless Communication device called XBee. Meanwhile, the energy meter plays the role as the master to collect both data of electricity and water usage before transmitting it to the main terminal unit for data logging and data management purpose. The transmission of data from the energy meter to the terminal unit is achieved through Power Line Communication (PLC). In addition, GSM module also been integrated into this system for data transmission purpose for the consumers.

1.1 Problem statement

Below are the problem statements referred and motivation that enable to develop this project:

1. The staffs of the utility company faces difficulty in taking the measurement of the energy and water meter from each house on monthly basis for billing purpose. Sometimes it creates an inconvenient way for utility staff to take reading of the meter that is located inside of the consumers premise or in an enclosed environment that consumes time [2].
2. The consumers are not aware of their utility usage until the utility company issues them a bill at the end of every month. This situation creates difficulties for the customers in predicting, controlling and managing their utilities usage [1].
3. No visual type of information is available on the charges in Ringgit Malaysia (RM) corresponding to the real time utility usage by the customer.

1.2 Motivation

The development of the Integrated Utility System was initiated for a solution to overcome few identified problems as mentioned below:

- 1 Utility staffs face difficulties in recording the utility meter reading on monthly basis. The present method is to record the readings by travelling from one unit to another unit of house. Implementation of such method consumes time and sometimes the location of the utility meter at the premise makes it inconvenient for the staffs to proceed with their task. Solution on recording the utility meter readings towards more systematic manner is required especially rapid development on residential area is in the progress.
- 2 Conventional way of customer getting to know their utility usage is based on monthly basis. This is due to the prefixed system by the utility company sending a billing statement at the end of the month. This creates lack of awareness on the usage of utility service by the consumer and prone to lead to wastage of utility usage.
- 3 Acknowledgement on the usage of utility service is much understood by viewing it based on currency value instead of specific utility unit either in kWh or m³ (units for energy meter and water meter respectively). Many consumers are concerned on the amount of money that needed to be paid for the used utility usage instead of calculating it using the specific unit (kWh or m³) with the company tariff personally. So designing a system that able to show a real time data on the utility usage with its corresponding chargers would enable the consumer to acknowledge themselves with the information on their utility usage in a much clearer view and easier to understand.