

**DEVELOPMENT OF VISUAL BASIC BASED GUI FOR OPTION A  
ENERGY SAVINGS OF IPMVP**

This thesis is presented in partial fulfillment for the award of the  
Bachelor of Engineering (Hons) Electrical (Power)

**UNIVERSITI TEKNOLOGI MARA  
SHAH ALAM, SELANGOR  
MALAYSIA**



**MAXMILLAN DAVID  
FACULTY OF ELECTRICAL ENGINEERING  
UNIVERSITI TEKNOLOGI MARA  
40450 SHAH ALAM  
SELANGOR DARUL EHSAN**

## **ACKNOWLEDGEMENT**

I would like to express my sincere gratitude to my project supervisor Dr. Nofri Yenita Binti Dahlan, department of electrical engineering, UITM Shah Alam for continuous giving me guidance and support to accomplish my research. Without her guidance, It would be difficult to complete this project.

Thank you to all my fellow friends Fadrick bin Uno and Cosmarvin Alfred Cosmas for spending their time together to learn how to use the visual basic 2010. Their continuous support and sharing their knowlegde was very helpful to complete for my project.

Last but not the least, I would like to thank you to my family for their prayers, financial support and positive support in accomplishing my study.

## **ABSTRACT**

This paper presents the development of Graphical User Interface (GUI) for determining energy saving under Option A i.e. retrofit isolation from International Performance Measurement and Verification (IPMVP) protocol. The GUI is developed by using Microsoft Visual Basic 2010. In Option A of retrofit isolation, savings are determined by partial field measurement of the energy used to which an Energy Conservative Measure (ECM) was installed separate from the energy use of the rest of the facility. The GUI consists of three most applied Option A ECM projects, i.e. 1) lighting efficiency improvement, 2) lighting system retrofitting with dimmer and 3) chiller efficiency improvement. This Option A Visual basic-based GUI could guide and help Energy Service Company (ESCO) and facility owner to calculate energy saving that involves retrofit isolation energy efficiency projects adhere to IPMVP protocol.

## CONTENTS

	Pages
<b>ACKNOWLEDGEMENT</b>	<b>i</b>
<b>ABSTRACT</b>	<b>ii</b>
<b>CONTENTS</b>	<b>iii</b>
<b>LIST OF FIGURES</b>	<b>v</b>
<b>LIST OF TABLES</b>	<b>vi</b>
<b>LIST OF ABBREVIATION</b>	<b>vii</b>
<b>1.0 INTRODUCTION</b>	<b>1</b>
1.1 Introduction	1
1.2 Project Background	3
1.3 Objectives	4
1.4 Scope of the Project	4
<b>2.0 LITERATURE REVIEW</b>	<b>5</b>
2.1 Introduction	5
2.2 Lighting Energy	5
2.3 Chiller System	6
2.4 International Performance Measurement And Verification Protocol	7
2.4.1 Benefit Of IPMVP	7
2.4.2 Measurement and Verification (M&V)	8
2.5 Visual Basic as Graphical User Interface (GUI)	8
<b>3.0 METHODOLOGY</b>	<b>11</b>
3.0 Introduction	11
3.1 Model Description	11
3.2 Types of the Retrofitting In Visual Basic Based GUI	14
3.2.1 Retrofitting Lighting Fixture	14

# **CHAPTER 1**

## **INTRODUCTION**

### **1.1 INTRODUCTION**

Energy efficiency is known as less energy use but providing the same performance or even greater [1]. The benefits of energy efficient are not only to some individual, but it will also improves the economy, save a lot of money and create a better environment to our country [2]. In Malaysia, energy consumption still needs to be concern due to development of this country. The increasing of the population is one of the factor that increasing the energy usage. Many new buildings in Malaysia have already started to develop new techniques to reduce the electric used in the buildings by using efficient energy however; the energy consumption that produces especially to commercial and residential building is still high. Statistic in year 2011 shows that 14% of the total energy consumption in Malaysia was from commercial building and 53% was from residential building [3]. Cooling system and lighting system consume the highest percentage of energy usage. The increases of tariff price in Malaysia this year gives a huge impact to most of the electricity consumers particularly to the industrial and commercial users. This will lead to the change in energy consumption behavior in the residential and buildings.