

ELECTRICITY DEMAND RESPONSE MODEL FOR MONOPOLISED  
ELECTRICITY MARKET

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A project report submitted in partial fulfilment of the requirements for the award of the  
degree of Master of Engineering (Electrical-Power)

Faculty of Electrical Engineering  
Universiti Teknologi Malaysia

JANUARY 2013

*Specially dedicated to my dearest mum, Nor Azilaa Binti Abdul Rahman and my dad Moh Nazar Bin Kahar, and my siblings who have encouraged, guided and inspired me throughout my journey of education.*

## **ACKNOWLEDGEMENT**

First of all, I would like to express my gratitude to my project supervisor Dr. Md. Pauzi bin Abdullah for his valuable guidance, most appreciable help, assistance and encouragement as well as the knowledge he shares during the course of this project. I am grateful to my panel for their comments and suggestion on this project.

My outmost thanks also go to my family who has given me support throughout my academic years. Without them, I might not be able to become who I am today. I am grateful to have love affection and care from all of my family members as well.

My thanks are also extending to all lecturers who taught me and my fellow friends for sharing their ideas and discussions.

## ABSTRACT

Demand response (DR) is changes created by customers according to accustomed electric patterns used in order to reduce or shift usage electrical load over time. Thus, it enable customer participation in reducing electricity consumption during peak hour period and increasing electricity consumption during off peak hour period This in turn will avoid an excessive utilization of generator during peak hour. This project was focusing on time based program which is consists of Time of Use (ToU) and Real Time Pricing (RTP). Time of Use (ToU) utilize in providing customer with different unit prices for uses in different block of times in 24 hour period while Real Time Pricing (RTP) work in offering the price that fluctuates hourly based on changes in market price. In order to implement time based program in Malaysia, a proper scheme pricing have been proposed. Generally, Malaysia is a monopolized electricity market in which wholesale market price does not existed. Referring on the current scenario, this project was developed to investigate a different pricing schemes demand response model and thus proposing a new pricing scheme to accommodate monopolized market. A comparison of pricing scheme utilize between three different industrial consumers will be discussed and stipulated as the outcome in this research.

## ABSTRAK

Respon permintaan (DR) adalah perubahan yang diubah oleh pelanggan mengikut corak elektrik yang biasa digunakan untuk mengurangkan atau mengalihkan beban penggunaan elektrik sepanjang masa. Oleh itu, ia membolehkan penyertaan pelanggan dalam mengurangkan penggunaan elektrik dalam tempoh waktu puncak dan meningkatkan penggunaan elektrik semasa tempoh waktu tidak puncak. Ini seterusnya akan mengelakkan penggunaan penjana yang mahal semasa waktu puncak. Projek ini memberi tumpuan kepada program berasaskan masa yang terdiri waktu (ToU) dan (RTP). ToU menyediakan pelanggan dengan harga unit yang berbeza untuk kegunaan di dalam blok yang berbeza-beza dalam tempoh 24 jam manakala RTP menawarkan harga yang berubah-ubah berdasarkan perubahan setiap jam dalam harga pasaran. Dalam usaha untuk melaksanakan program yang berpangkalan di Malaysia, skim penetapan harga yang betul telah dicadangkan. Secara umumnya, Malaysia adalah pasaran elektrik dimonopoli di mana harga pasaran borong tidak wujud. Merujuk pada senario semasa, projek ini dibangunkan untuk menyiasat skim harga yang berbeza untuk model response permintaan dan seterusnya mencadangkan skim harga baru untuk menampung pasaran yang dimonopoli. Satu perbandingan skim harga menggunakan tiga pengguna perindustrian yang berbeza akan dibincangkan dan ditetapkan sebagai analisis dalam kajian ini.

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## **LIST OF ABBREVIATIONS**

DR	Demand Response
RM	Ringgit Malaysia
RTP	Real Time Pricing
TNB	Tenaga Nasional Berhad
ToU	Time of Use
ToU-slots	Time of Use with slots

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## **CHAPTER 1**

### **INTRODUCTION**

#### **1.1 Introduction**

Demand response (DR) is a change in electricity consumption by end use customers such as normal consumption pattern that they use to changes in electricity prices from time to time. In other words, demand response is the short term changes by customer in their accustomed electric patterns to reduce or shift electrical load over time. It allows customer participation in reducing electricity consumption during peak hour period. Demand response model also need wholesale market prices in order to work in monopolized market.

There have two types of demand response which is incentive based program and time based program. Incentive based program are involve contract normally exists between the utility and distribution. Incentive based program include direct load control, interruptible/ curtailable service, demand bidding/ buy back, emergency demand response program, capacity market program and ancillary service markets.

Other types of demand response are time based program. This program allow customer to choose whether to use electricity at a lower electricity price (during off

peak) or high electricity price (during peak hour). In other words, time based demand response program will influence consumer behavior in using the electricity. There are three categories for time based program which are time of use, real time pricing and critical peak pricing. The electricity prices change in time based program for different periods according to the electricity supply cost. While for incentive based program there are voluntary programs which are they are not penalized if customers do not curtail consumption.

## **1.2 Objectives**

The objectives of this project are:

- i. To investigate different pricing schemes in demand response model
- ii. To propose a new pricing scheme in order to work in monopolized market
- iii. To compare the pricing schemes utilizing different consumers in monopolized market

### **1.3 Scopes of Project**

This research focus on time based program consists of Time of Use (ToU) scheme and Real Time Pricing (RTP) scheme in demand response program. However in Malaysia, ToU scheme and RTP scheme cannot be implementing because this scheme need wholesale market. In order to implement it, the ToU-slots scheme is proposed. ToU-slots scheme comes from concepts of RTP and ToU pricing. The fixed pricing scheme is also included in analysis for the discussion purposed. This all scheme are test on three industrial consumers.

### **1.4 Problem Statement**

In well established countries such as United State, demand response can be utilized because they have a variety of market price in order to supply electricity to the consumers. While in Malaysia, market price is rigid and inflexible according to the different usage being by consumer. Electricity consumption in Malaysia is rapidly increasing due to the lifestyle changing and escalation in population growth. Hence, to implement the demand response model in Malaysia, it necessary right pricing scheme.



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