REACTIVE POWER TRACKING IN A POWER TRANSMISSION NETWORKS

This project report is presented in partial fulfillment for the award of the

Bachelor in Electrical Engineering (Hons.)

Of

UNIVERSITI TEKNOLOGI MARA (UiTM)

ZULAILAH BINTI ZAKARIA
B. ENG (Hons.) ELECTRICAL
Faculty of Electrical Engineering
UNIVERSITI TEKNOLOGI MARA
40450, Shah Alam, Selangor Darul Ehsan
Malaysia

ACKNOWLEDGEMENT

Firstly, I would like to especially thank my project supervisor, Dr. Ismail Musirin for his critical comment, guidance and willingly gives his ideas and suggestions for completing my project. Every single knowledge that had been given by during this period will always be my precious treasure.

My project studies would not have been completed without the help; and the friendship of others gave me so much help and support during my final project.

Also, not forgotten to my lecturers for their support and encouragement directly or indirectly throughout my course in UiTM, especially by the time of completing the project.

Finally, with my love and gratitude, I want to dedicate this thesis to my family who has supported me throughout, especially to my mother and my father.

Zulailah Binti Zakaria
Faculty of Electrical Engineering
Universiti Teknologi Mara (UiTM)
Shah Alam, Selangor Darul Ehsan
Malaysia

ABSTRACT

This thesis presents reactive power tracking in a power transmission networks. This proposes a comprehensive power tracking methodology to assess the reactive power performance in network-wide applications. The tracking algorithm is based on electric circuit's principles using IEEE 14-bus power transmission as the test specimen. It is originated by the power flow solution of a network. In this study emphasis is place on the dominion loss of the transmission lines in order to determine the allocating charges for the use of line.

Index terms – Tracking, power flows, transmission pricing.

REACTIVE POWER TRACKING IN A POWER TRANSMISSION NETWORKS

TABLE OF CONTENTS

CHAPTER 1

INTRODUCTION

1.0 Introduction

The mesh structure of high-voltage transmission networks provides a large number of possible routes by which electrical power can flow from the sources (generators) to the sinks (ground supply points, here referred to as loads). Tracing the connections using the load flow program is not possible as changing a demand or generation at any node would result in a corresponding change of generation coming from the marginal (swing plant) as reported by [1].

Hence, the conventional wisdom is that with an integrated system; is not possible to trace electricity from a particular generator to a particular supplier [2]. It is only possible to determine relation between the generators (or loads) and the flows in transmission lines by means of sensitivity analysis, that is by determining how a change in a nodal generation/demand influences the flow in a particular line as reported in [3,4].

Recently, the subject of power tracking has had a reasonable level of exposure in the open literature. However, the subject of reactive power has received very limited attention in spite of the importance that reactive power flows have on transmission losses and voltage collapse problems as reported in [4-6]. Therefore, a novel electricity tracing method has been proposed in Refs. [5, 6] which allows one to trace the flow of electricity in a meshed network. However, there are no clear declaration and proof of the conditions required for the method.

In addition, the best-known algorithm to track reactive power is based on the information given by a power flow solution, a reactive power flow distribution matrix is created, which represents a proportional sharing of the total power