OPTIMAL LOCATION AND SIZING OF DISTRIBUTED GENERATOR FOR LOSS MINIMIZATION AND VOLTAGE IMPROVEMENT IN A POWER SYSTEM USING ARTIFICIAL IMMUNE SYSTEM

This thesis is presented in partial fulfillment for the award of the

Bachelor of Electrical Engineering (Honors)

UNIVERSITI TEKNOLOGI MARA

MOHD AZWAN BIN AHMAD

FACULTY OF ELECTRICAL ENGINEERING

UNIVERSITI TEKNOLOGI MARA

40450 SHAH ALAM, SELANGOR

ACKNOWLEDGEMENT

In the name of Allah, Most Gracious, Most Merciful. Praised to Prophet Muhammad S.A.W, his companions and those who are on the path as what he preached upon. My everlasting thank to Allah for granting me patience and hope in completing this project.

I would like to express my gratitude and appreciation to my supervisor Associate Professor Dr. Titik Khawa Bt. Abdul Rahman for his invaluable suggestions, guidance and constant encouragement.

To my family, especially my parents for their motivation and support. Without them, I don't think I will be where I am today and I'm proud to be their sons.

Last but not least, special thanks to my friends especially, Abu Yamin, Sazwan, Liza, Laili, Azmi, Nasrul and Niz for their help and advices throughout the process of completing this project.

Thank you.

Mohd Azwan Bin Ahmad
Faculty Of Electrical Engineering
Universiti Teknologi Mara (UiTM)
Shah Alam, Selangor Darul Ehsan
December 2005

ABSTRACT

Distributed Energy Resources (DER) has becoming more popular in the transmission system nowadays. It has been focusing on their potential to influence the dynamic stability of a transmission system. A major problem with any solution for Distributed Generation (DG) is the coordination of Distributed Energy Resources (DER) to meet demand.

This report present the values of Distributed Generator (DG) that are very dependent on its type, size and location as it was installed. In order to enhance the reliability and obtain the benefits for DG placement, a strategic DG placement technique is proposed in this paper. The performance of this technique is tested using 30 buses IEEE Reliability Test System. An optimization programmed written in MATLAB by using Artificial Immune System (AIS) technique was used to compute power flow. The test result shows that the location and sizing of the DG identified by the proposed technique has been able to improve voltage stability of the system and also minimize the power losses.

TABLE OF CONTENTS

CHAPTER 1

INTRODUCTION

1.1 Introduction

Distributed, dispersed, decentralized or embedded generation (DG, EG) are keywords for an upcoming probable paradigm shift in electric power generation. As mentioned [1], there is no standing international definition for these terms, but there are number of legal definitions in several countries. A proposal for a definition of distributed generation is given in [2]. However, many distributed power sources have some characteristics in common:

- Their rating is small compared to conventional power plants,
- They are often privately owned,
- They are not centrally dispatched,
- They are connected to MV or LV distribution networks,
- They do not contribute to frequency or voltage control,
- And usually they were not considered when the local grid was planned. Hence, there are infrastructural needs as, for example, means of communication.

Two major reasons for an increased utilization of DG are liberalized markets which are now opened for various kinds of participants and the global trend of reducing greenhouse gas emissions which leads to more renewable, CO_2-neutral sources which are normally small-scaled. Further reasons are discussed in [1] and others.

Besides a number of benefits, there are some technical, economical and regulatory issues with DG. In terms of market regulation, licensing, government aid and privacy are typical concerns. Economical considerations display a possible cost