VOLTAGE STABILITY IMPROVEMENT IN POWER SYSTEM

Thesis presented in partial fulfillment for the award of the

Bachelor in Electrical Engineering (Hons.)

Of

UNIVERSITI TEKNOLOGI MARA (UiTM)

SITI SALWANI BINTI SAMAT
B. ENG (Hons.) ELECTRICAL
Faculty of Electrical Engineering
UNIVERSITI TEKNOLOGI MARA (UiTM)
40450 Shah Alam, Selangor Darul Ehsan
Malaysia

ACKNOWLEDGEMENT

In the name of Allah the most Beneficent and Merciful. A deep sense of thankfulness to Allah who has given me the strength, ability and patience to complete this project and thesis as it is today, Alhamdulillah.

I would like to take this opportunity to put into words my deepest gratitude and appreciation to the project supervisor, **Associate Professor Wan Norainin Bt. Wan Abdullah** for her valuable guidance, helpful advice and unlimited support during this project is undergoing.

I would also like to express my largest appreciation to my family for their invaluable support during my study time until the completion of this thesis.

Finally yet importantly, thanks to all my friends and the persons who are directly or indirectly contributed, because, their perspective and guidance helped greatly to point me in the right direction until the completion of this thesis.

SITI SALWANI BINTI SAMAT
FACULTY OF ELECTRICAL ENGINEERING
UNIVERSITI TEKNOLOGI MARA (UiTM)
SHAH ALAM, SELANGOR DARUL EHSAN,
MALAYSIA

ABSTRACT

This paper presents the study on voltage stability and its improvement in power system. Load flow analysis at various loading conditions will be performed to view the effect of loading condition to voltage instability. Voltage instability will be improved using shunt capacitors and tap changing transformers. This paper will apply the Newton-Raphson algorithm in the load flow analysis. The programs were simulated on the IEEE 30 bus Reliability Test System (RTS). A MATLAB version 7.0 programming load flow program is used for all simulations.

Keywords: Voltage stability, voltage collapse, shunt capacitor, tap changing transformer, power flow analysis, Newton Raphson.

TABLE OF CONTENTS

CHAPTER 1

INTRODUCTION

1.0 INTRODUCTION

Electric utilities of today are facing more problems than ever before with trying to provide economical electric power to their customers and trying to allow an increase in the amount of power that is transferred between interconnected utilities and independent power producers. This increase in power flow leads to transmission networks becoming heavily loaded, causing the thermal capacity of the line to reach their limits. In the event of a contingency in the system, the lines are required to carry an even larger load. With the increased power flow due to heavy loading, the system reactive power loses increase dramatically; this loss of reactive power may eventually lead to voltage instability [1].

The voltage stability problem has become a major concern in operating and planning today's power system as a result of heavier loading conditions, without sufficient transmission and/or generation enhancements. Voltage stability problems normally occur in heavily stressed systems. While the disturbance leading to voltage collapse may be initiated by a variety of causes, the underlying problem is an inherent weakness in the power system.

The factors contributing to voltage collapse are:

i. Generator reactive power voltage control limits
ii. Load characteristics
iii. Characteristics of reactive compensation devices
iv. Action of the voltage control devices such as transformer on - load tap changers (OLTCs) [5].