VOLTAGE PROFILE IMPROVEMENT TECHNIQUE USING TRANSFORMER TAP CHANGER SETTING BASED ON EVOLUTIONARY PROGRAMMING (EP) OPTIMIZATION TECHNIQUE.

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

UNIVERSITI TEKNOLOGI MARA MALAYSIA

MOHD PAHLAWI BIN HANAFI
Faculty of Electrical Engineering
UNIVERSITI TEKNOLOGI MARA
40450 Shah Alam.
Selangor Darul Ehsan.

ACKNOWLEDGEMENT

All praise to ALLAH S.W.T, The Most Gracious and Most Merciful who has given me the strength, ability and patience to complete this project.

Firstly, I would like to convey my deepest gratitude and appreciation to my project supervisor, En. Ismail Musirin for his invaluable suggestion, guidance and advice for completing this project.

I would also like to thank the panel members for their cooperation and advice.

Last but not least, thank to beloved parent, to all my friends Mohd Idris, Mahadi and many others who somehow had helped me directly or indirectly in successful by completing my project.

ABSTRACT

The voltage unstable condition was found to be caused by the stressed condition in a power system. Various technique were reported in order to improve the voltage stability condition such as reactive power dispatch, transformer tap changer setting, capacitor placement on the local bus and flexible transmission AC (FACTS) devices. This report presents the application of EP in optimizing transformer tap changer setting (TTCS) for voltage profile improvement. The objective is voltage profile improvement with the TTCS as the control variables. Tests have been conducted at various loading conditions in the IEEE 14 Bus Reliability Test System. Results showed that the proposed technique is able to improve the voltage profile in the system using the TTCS as the control variables. The optimized TTCS values can be utilized by the power system operators to perform voltage profile improvement schema.

TABLE OF CONTENTS

CHAPTER 1
INTRODUCTION

1.1 Background

Continuous power demand experienced in the power transmission network has caused stress condition to the power system network. This event has lead to voltage decay and increase in transmission loss. The stress condition can be alleviated by performing a proper reactive power support, which normally involves the optimization process. Transformer tap changer setting values optimization could be technique to overcome this situation.

Transformers which provide a small adjustment of voltage magnitude, usually in the range of ±10% and others which shift the phase angle of the line voltages are important components of a power system [1]. Some transformers regulate both the magnitude and phase angle. Almost all transformers provide taps on windings to adjust the ratio of transformation by changing taps when the transformer is reenergized. A change in tap can be made while the transformer is energized and such transformers are called *load-tap-changing* (LTC) *transformer or tap-changing-under-load* (TCUL) *transformers*. The tap changing is automatic and operated by motors which respond to relays set to hold the voltage at the prescribed level. Special circuits allow the change to be made without interrupting the current [1].Recently, due to the tendency of increasing loads on networks with long transmission lines, voltage stability has been one of the major topics among power system engineers. This problem has long been studied by many researchers through various approaches which are roughly divided into groups; one is the so called static stability, while the other one is the dynamic stability. In static stability algebraic equations such as the load flow equations [2] are inuporated to perform the analysis. Tap changing control is usually performed in a decentralized manner, i.e. independently and only at the locations where voltage violations are present [3].