

**MATLAB SIMULINK FOR MODELLING FACTS DEVICES
APPLICATION IN POWER TRANSMISSION NETWORK**

**Project report presented in the partial fulfillment for the award of the Bachelor of
Electrical Engineering (Hons)
UNIVERSITI TEKNOLOGI MARA**



MOHD FADLY BIN RAZAK

**FACULTY OF ELECTRICAL ENGINEERING
UNIVERSITI TEKNOLOGI MARA**

40450 SHAH ALAM, SELANGOR

ACKNOWLEDGEMENT

In the name of Allah, The Most Gracious, The Most Merciful and The Most Beneficent. Praise in only Allah S.W.T for his bounty and blessing upon us. It is with deepest sense of gratitude to Allah who has given me the strength and ability to complete this project as it is today.

This paper could not be a possible without Mr. Nik Fasdi Bin Nik Ismail. I do pay great homage and concede Mr. Nik Fasdi Bin Nik Ismail (Lecture of Power System) for his pioneering in modeling FACTS devices and his immense technical support to accomplish this goal. I've spent couple of hours with him to share vision and thoughts which are most memorable for me and I look forward to see him again in near future.

I would also like to express my deepest thanks to my friends, as my course mates in UiTM who had shares with me their valuable ideas in modelling FACTS (Flexible AC Transmission System) using MATLAB SIMULINK toward the completion of this project.

Also special thank to Mr Nikman who is engineer at Tenaga Nasional Berhad Wisma Bintang at Petaling Jaya for his guidance and knowledge in Static Var Compensator (SVC). The SVC device is installed at KL North for TNB Transmission line system.

Special thanks also to all lecturers in Faculty of Electrical Engineering, UiTM and to those who have devoted their time either directly or indirectly, for their ideas, support and a lot of contribution towards the success of this project.

Last but not least, to both of my parents and family for their understanding and support throughout the years. You all are the source of my strength and inspiration.

Mohd Fadly Bin Razak.
Faculty of Electrical Engineering
University Teknologi Mara (UiTM)

ABSTRACT

This project focuses in the modeling of FACTS (Flexible AC Transmission System) devices application in power transmission network utilizing Matlab Simulink software. There are two FACTS devices discussed in this study; the SVC (Static Var Compensator) and STATCOM (Static Synchronous Compensator). The effects of both SVC and STATCOM will be thoroughly looked into on their application in the power transmission network. That includes analyzing the effect of different transmission length, effect of load variation, as well as effect of dynamic response of STATCOM and SVC under fault condition. When system voltage is low, the FACTS generate reactive power (FACTS capacitive). When system voltage is high, it absorbs reactive power (FACTS inductive). The designed was tested on IEEE 9 busbar system using MATLAB SIMULINK. It comes with the phasor simulation method, activated with the Powergui block.

TABLE OF CONTENT

PAGE

DECLARATION	i
DEDICATION	ii
ACKNOWLEDGEMENT	iii
ABSTRACT	iv
TABLE OF CONTENTS	v
LIST OF FIGURES	viii
LIST OF TABLES	x
LIST OF SYMBOLS AND ABBREVIATIONS	xi
CHAPTER 1	
INTRODUCTION	
1.1 GENERAL	1
1.2 OBJECTIVE OF STUDY	2
1.3 SCOPE OF THE THESIS	2
1.4 ORGANIZATION OF THE THESIS	3
CHAPTER 2	
LITERATURE REVIEW	
2.1 FACTS	4

2.2	STATIC VOLTAGE STABILITY	5
2.3	STATCOM	6
2.4	SVC	7
2.5	STATCOM VERSUS SVC	8

CHAPTER 3

METHODOLOGY

3.1	INTRODUCTION	9
3.2	FACTS	10
3.3	STATCOM ANALYSIS	12
3.3.1	Statcom Operating Principle	13
3.3.2	Injection and Absorb Of Reactive Power	14
3.4	SVC	15
3.5	CIRCUIT DESCRIPTION	17
3.6	MODEL DESCRIPTION	20
3.6.1	STATCOM	23
3.6.1.1	STATCOM Control System	26
3.6.1.2	STATCOM V-I Characteristic	27
3.6.2	SVC	28
3.6.2.1	SVC Control System	29