Paper has been submitted to the 4th International Conference on
"Technical and Physical Problems of Power Engineering" (TPE-2008)
4-6 September 2008, University of Pitesti, Pitesti, Romania
www.ictpe.com

REACTIVE POWER CONTROL WITH SHUNT FACTS DEVICES

N.M. Tabatabaei [1] **Gh. Aghajani [2]** **J.M. Tabatabaei [3]**

1 Electrical Engineering Department, Azarbaijan University of Tarbiat Moallem, Tabriz, Iran
Electrical Engineering Department, Seraj Higher Education Institute, Tabriz, Iran
Engineering Department, Atrak Energy Co., Tehran, Iran, n.m.tabatabaei@gmail.com

2 Electrical Engineering Department, Azarbaijan University of Tarbiat Moallem, Tabriz, Iran

3 Azerbaijan University of Architecture and Construction, Baku, Azerbaijan, nadermt@gmail.com

Keywords: FACTS, STATCOM, SVC, Reactive Power Control

Abstract- Shunt Flexible AC Transmission System (FACTS) devices, when placed at the mid-point of a long transmission line, play an important role in controlling the reactive power flow to the power network and hence both the system voltage fluctuations and transient stability. This paper deals with the location of a shunt FACTS device to improve transient stability in a long transmission line with predefined direction of real power flow. The validity of the mid-point location of shunt FACTS devices is verified, with different shunt FACTS devices, namely Static VAR Compensator (SVC) and Static Synchronous Compensator (STATCOM) in a long transmission line using the actual line model.

I. INTRODUCTION

Recent development of power electronics introduces the use of FACTS devices in power systems. FACTS devices are capable of controlling the network condition in a very fast manner. Reactive power compensation is an important issue in electrical power systems and shunt FACTS devices play an important role in controlling the reactive power flow to the power network [1].

SVC and STATCOM are members of FACTS family that area connected in shunt with the system. Even though the primary purpose of shunt FACTS devices is to support bus voltage by injecting/absorbing reactive power. They area also capable of improving the transient stability by increasing/decreasing the power transfer capability when the machine angle increases/decreases which is achieved by operating the shunt FACTS devices in capacitive/inductive mode [2].

Previous works on the topic prove that shunt FACTS devices give maximum benefit from their stabilized voltage support when sited at the mid-point of the transmission line. The proof of maximum increase in power transfer capability is based on the simplified model of the line neglecting line resistance and capacitance [3, 4]. However, for long transmission lines, when the actual model of the line is considered, the results may deviate significantly from those found for the simplified model [5].

The paper is organized as follows: section 2 gives a brief introduction of the shunt FACTS devices used. A tow area system with a shunt FACTS device is described in section 3.

The computer simulation results for system under study are presented and discussed in section 4 and discussed in section 5 conclusions are given the various parameters of the system are listed in Appendix.

II. SHUNT FACTS DEVICES IN POWER SYSTEM

Shunt FACTS devices are classified into two categories, namely variable impedance type (SVC) and switching converter type (STATCOM).

A. SVC

The SVC uses conventional thyristors to achieve fast control of shunt connected capacitors and reactors. The configuration of the SVC is shown in Figure 1, which basically consists of a fixed capacitor (C) and a thyristor controlled reactor (L). The firing angle control of the thyristor banks determines the equivalent shunt admittance presented to the power system.

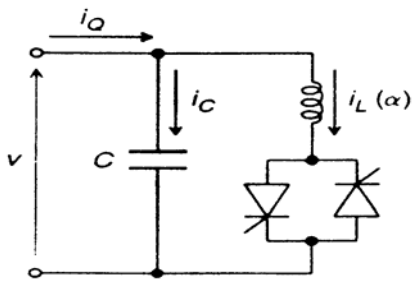

Figure 1. SVC configuration