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STUDY OF COMPENSATION DEVICE BY MAT LAB SIMULATION

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ABSTRACT

The example described in this section illustrates modeling of a simple transmission system containing two hydraulic power plants. A static var compensator (SVC) and power system stabilizers (PSS) are used to improve transient stability and power oscillation damping of the system. The power system illustrated in this example is quite simple. However, the phasor simulation method allows you to simulate more complex power grids.

Key words: Stability, SVC, PSS, UPFC.

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1. INTRODUCTION

Modern power systems are highly complex and are expected to fulfill the growing demands of power wherever required. To regulate and to balance the power of the AC transmission system some flexible operation is done. This flexible operation are consist of some devices like SVC, PSS, UPFC etc. here we are comparing the svc and pss and upfc in a transmission line.

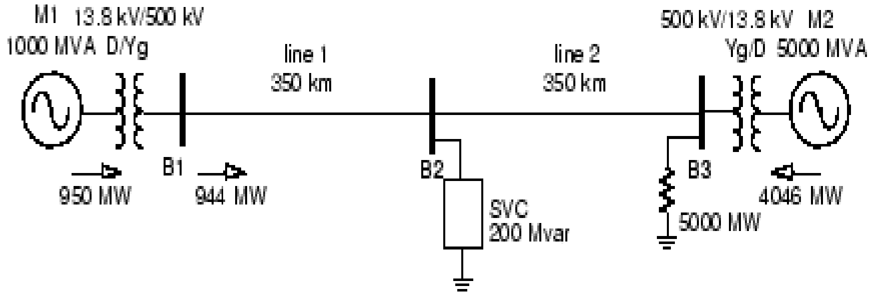
The Power System Stabilizer (PSS) is a supplementary excitation controller used to damp generator electro-mechanical oscillations in order to protect the shaft line and stabilize the grid. It also damps generator rotor angle swings, which are of greater range in frequencies in power system. A unified power flow controller (or UPFC) is an electrical device for providing fast-acting reactive power compensation on high-voltage electricity transmission networks. It uses a pair of three-phase controllable bridges to produce current that is injected into a transmission line using a series transformer. The controller can control active and reactive power flows in a transmission line. The UPFC uses solid state devices, which provide functional flexibility, generally not attainable by conventional thyristor controlled systems. The UPFC is a combination of a static synchronous compensator (STATCOM) and a static synchronous series compensator (SSSC) coupled via a common DC voltage link.

2. THEORETICAL DETAIL

2.1. Description of the Transmission System

The single line diagram shown below represents a simple 500 kV transmission system.

500 kV Transmission System



A 1000 MW hydraulic generation plant (M1) is connected to a load center through a long 500 kV, 700 km transmission line. The load center is modeled by a 5000 MW resistive load. The load is fed by the remote 1000 MVA plant and a local generation of 5000 MVA (plant M2).

A load flow has been performed on this system with plant M1 generating 950 MW so that plant M2 produces 4046 MW. The line carries 944 MW which is close to its surge impedance loading (SIL = 977 MW). To maintain system stability after faults, the transmission line is shunt compensated at its center by a 200 Mvar static var compensator (SVC). The SVC does not have a power oscillation damping (POD) unit. The two machines are equipped with a hydraulic turbine and governor (HTG), excitation system, and power system stabilizer (PSS).

3. DESCRIPTION OF SVC

The main advantage of SVCs over simple mechanically switched compensation schemes is their near-instantaneous response to changes in the system voltage.[7] For this reason they are often operated at close to their zero-point in order to maximize the reactive power correction they can rapidly provide when required.

They are, in general, cheaper, higher-capacity, faster and more reliable than dynamic compensation schemes such as synchronous condensers.[7] However, static VAR compensators are more expensive than mechanically switched capacitors, so many system operators use a combination of the two technologies (sometimes in the same installation), using the static VAR compensator to provide support for fast changes and the mechanically switched capacitors to provide steady-state VARs

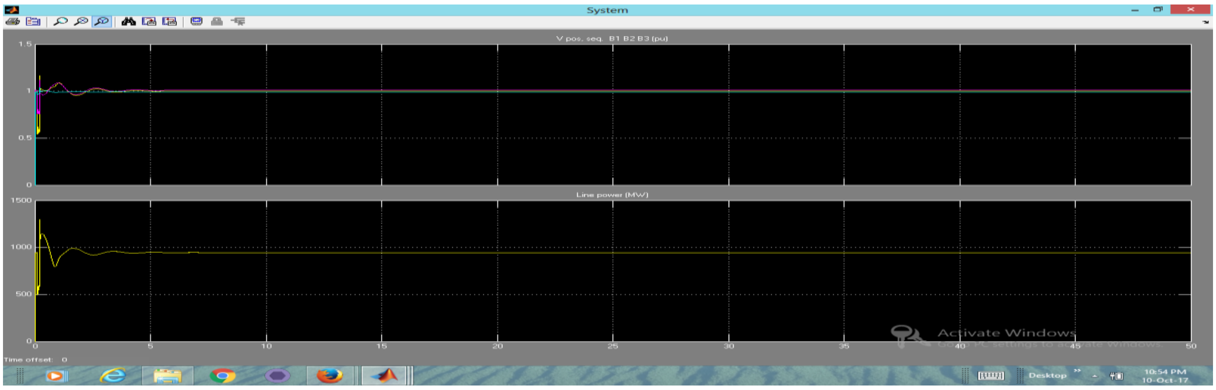
4. DESCRIPTION OF PSS

The Power System Stabilizer (PSS) is a supplementary excitation controller used to damp generator electro-mechanical oscillations in order to protect the shaft line and stabilize the grid. It also damps generator rotor angle swings, which are of greater range in frequencies in power system. A voltage stabilizer is an electrical appliance used to feed constant voltage current to electrical gadgets like ACs and computers, and protects them from damage due to voltage fluctuations. A power system stabilizer (PSS) installed in the excitation system of the synchronous generator improves the small-signal power system stability by damping out low frequency oscillations in the power system. It does that by providing supplementary perturbation signals in a feedback path to the alternator excitation system. In our project we review different conventional PSS design (CPSS) techniques along with modern adaptive neuro-fuzzy design techniques. We adapt a linearized single-machine infinite bus model for design and simulation of the CPSS and the voltage regulator (AVR). We use 3 different input signals in the feedback (PSS) path namely, speed variation(w), Electrical Power (Pe), and integral of accelerating power (Pe*w), and review the results in each case.

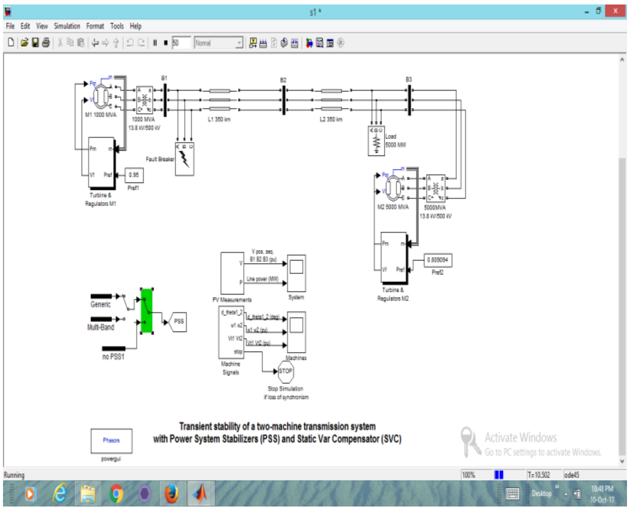
5. SOFTWARE ANALYSIS OF PROBLEM

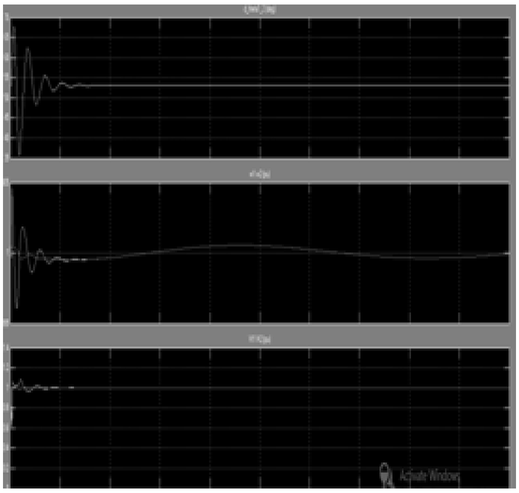
WITH PSS AND SVC

This is a demo power system model

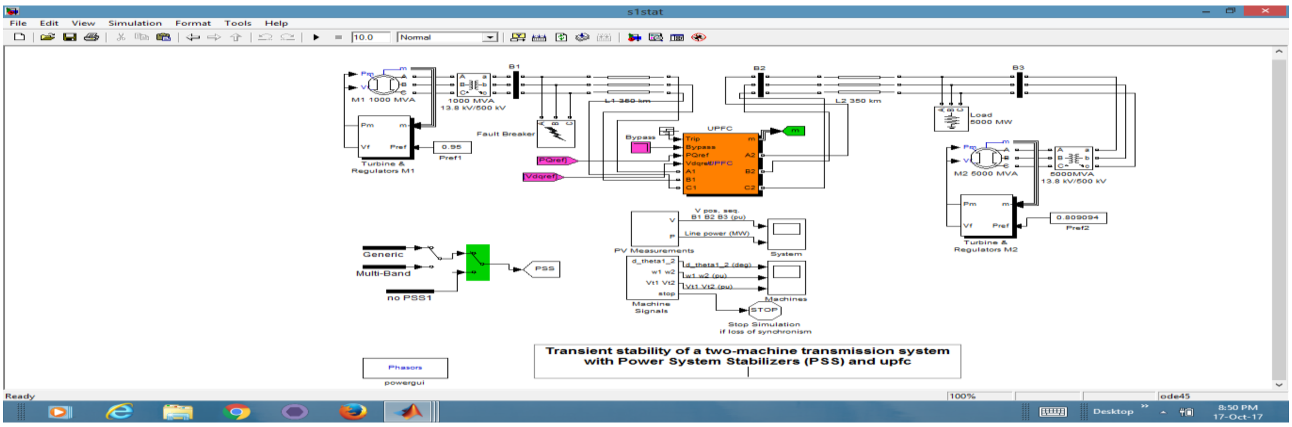


WITH PSS AND WITHOUT SVC

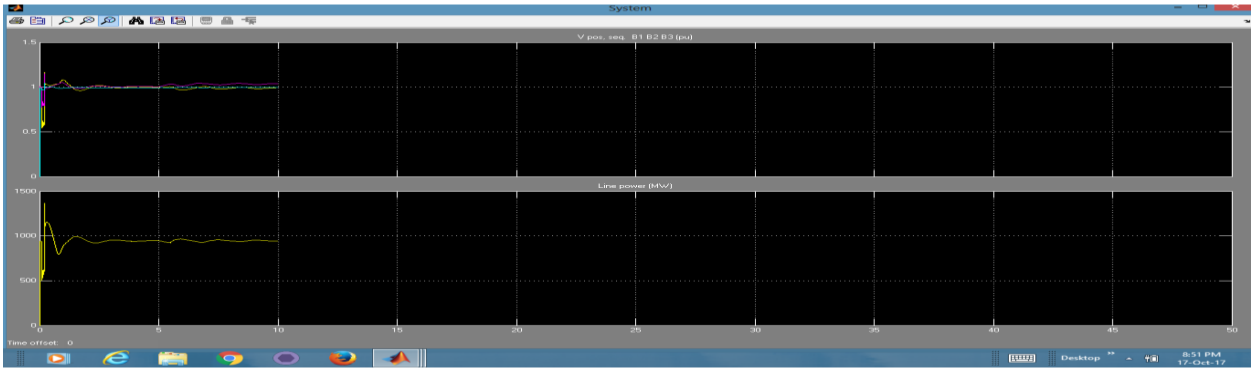


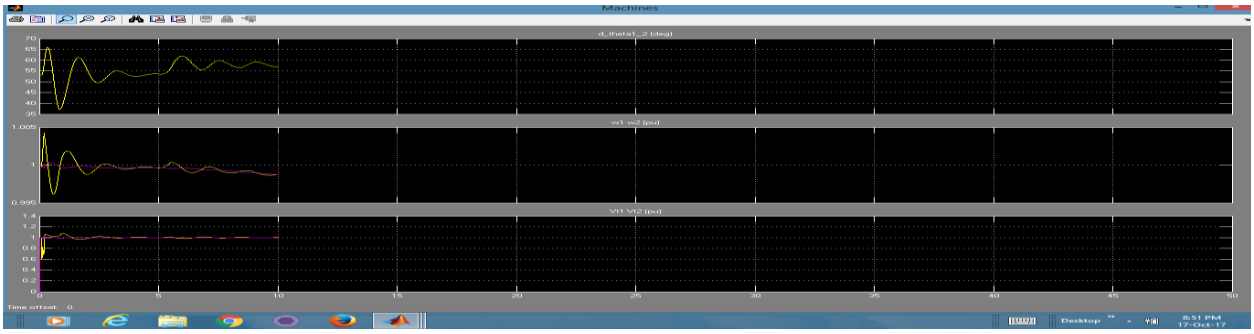


WITH PSS AND UPFC



GRAPHS





6. A DETAIL COMPARATIVE STUDIES OF PREVIOUS OF CURRENT PROPOSAL

From the simulation results shown in Figs. A comparison is made between the above FACTS devices for stability enhancement of two-area power system under study as shown in graphs. It is investigated that the UPFC is the effective FACTS device for stability enhancement of inter-area power system.

7. CONCLUSIONS

The power system stability enhancement of a two area power system by various FACTS devices is presented and discussed. Then the performance of the UPFC for power system stability improvement is compared with the other FACTS devices such as SVC.

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