ECE 529: Homework #3

Due Session 22 (March 8)

Problem 1: For the system below we want to increase the power transfer from Bus 1 to Bus 2 to 650 MW by adding a STATCOM at the midpoint. The STATCOM is connected through a 10:1 transformer with a leakage reactance of .02 \( \Omega \) on low voltage side, determine the MVA, voltage, and current supplied by the STATCOM. Simulate in a powerflow program and in ATP (using an idea source for the STATCOM for now).

![Diagram of Bus 1 to Bus 2 system with STATCOM]

Problem 2: For the system given, we want to increase power transfer from Bus 1 to Bus to 700 MW by adding a SSSC. The SSSC is controlled to inject a capacitive series voltage. If the SSSC is connected through a 4:1 transformer, with a leakage reactance of 0.1 p.u., determine the MVA, voltage and current supplied by the SSSC. The transformer is rated at 60 MVA and 5 kV (on the low voltage side facing the VSC). Simulate in a power flow program (as a series capacitor) and in ATP as an ideal source.

![Diagram of Bus 1 to Bus 2 system with SSSC]
(SSSC)
- Much more common at distribution level
- Static Synchronous Series Compensator (SSC)

(STATCOM) => Shunt Connected (Phase to Ground)
- Static Synchronous Compensator

FACTS
- Flexible AC Transmission Systems Devices
- Voltage Source Converter Based
- VoltaAGE Source Converter Based
3) Combined series/series or series/shunt Unified Power Flow Controller (UPFC) or Convertible Static Compensator (CSC)
$P=0$  

Either direction  

VSC  

STATCOM  

I_{ref} or Command $\rightarrow$ Iref  

Vdc  

current loops needed:  

$E_{dc}$  

$E_{ref}$  

$\Rightarrow$ Musik  

$VA=\text{Musik}$  

Power increment
Transformer to inject transformer

Circulate P from exciter

Phase angle regulator (Phase shift transformer)
A pressure electroni version of a

Uni field powered flow controller
For short - control Vdc
- Also acts as actuation
- Acts like starter
- Power Electronic Enter with VCS