

UTILITY APPLICATIONS OF POWER ELECTRONICS UI: ECE 529

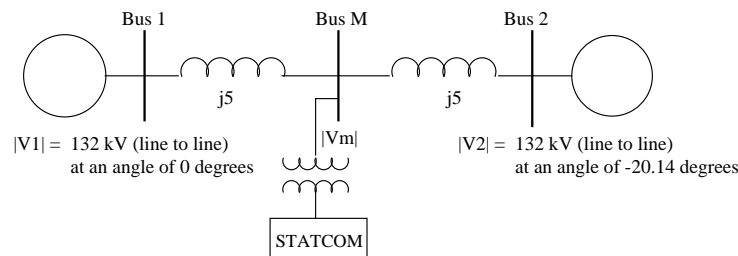
Homework 4

On campus: Due April 7

Off campus: April 14

1. For the system below we want to increase the power transfer from Bus 1 to Bus 2 to 700 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.

If this was implemented as a 48 pulse STATCOM, how much current would each 6 pulse bridge supply?



2. A semiconductor fab has a 4MW load that is sensitive to voltage sags and will trip when a sag lasting more than 5 cycles occurs. The plant is currently fed by a 13.2 kV distribution feeder.
 - (a) Describe the requirements necessary for installing a static source transfer switch for this case. What are the advantages and disadvantages of this approach. Give an approximate rating based on a peak load of 4 MW at a 0.9 lagging power factor. What limits the speed of this solution?
 - (b) What would need to be done differently if this was replaced with a solid state circuit breaker. How would the overall response time compare?
3. Given a Delta connected load on a 69kV system with $Z_{ab} = 10\Omega$ at an angle of 60 degrees, and $Z_{bc} = 5\Omega$ at an angle of 0 degrees, and $Z_{ca} = 5.77\Omega$ at an angle of 30 degrees find currents a STATCOM must provide to make the loads unity power factor (assume balanced voltage). Specify whether compensator is delta or wye connected.