ECE 529
Utility Applications of Power Electronics

Session 8
Circuit 4: Replace switch 2 with a diode and add capacitor on output precharged to 400 V:

![Circuit Diagram]

**Main: BtK1 and Diode Currents**

![Graph 1]

**Main: Output Voltage**

![Graph 2]
Zoomed view: shows time step effect on transition

Case 2:

Simulation results with \( L = 1 \text{ H} \): again, consistent with ATP

Simulation results with \( L = 10 \text{ mH} \): again, consistent with ATP
Case 3:

Switch currents in top plot and lower plot is current in the RC filter.
Case 4:
Impact of Fundament Rules of Power Electronics on Converter Topologies

- Design such that switch actions connect a voltage source (C) to a current source (L)
  - Sometime rotating machines substitute either
- Circuit design and control design to protect switches from overcurrent

Topologies

- Diode rectifiers
- Thyristor controlled rectifiers/inverters
  - Current source converters
  - DC/DC converters
- Switched mode power supplies
- Voltage sourced converters
- Transformer coupled converters
- Thyristor controlled reactor or capacitor

Rectifier → Power AC → DC
DC-AC power transformer
Line commutated converter
- AC voltage drives transfer between switches

DC voltage stiff

AC or DC