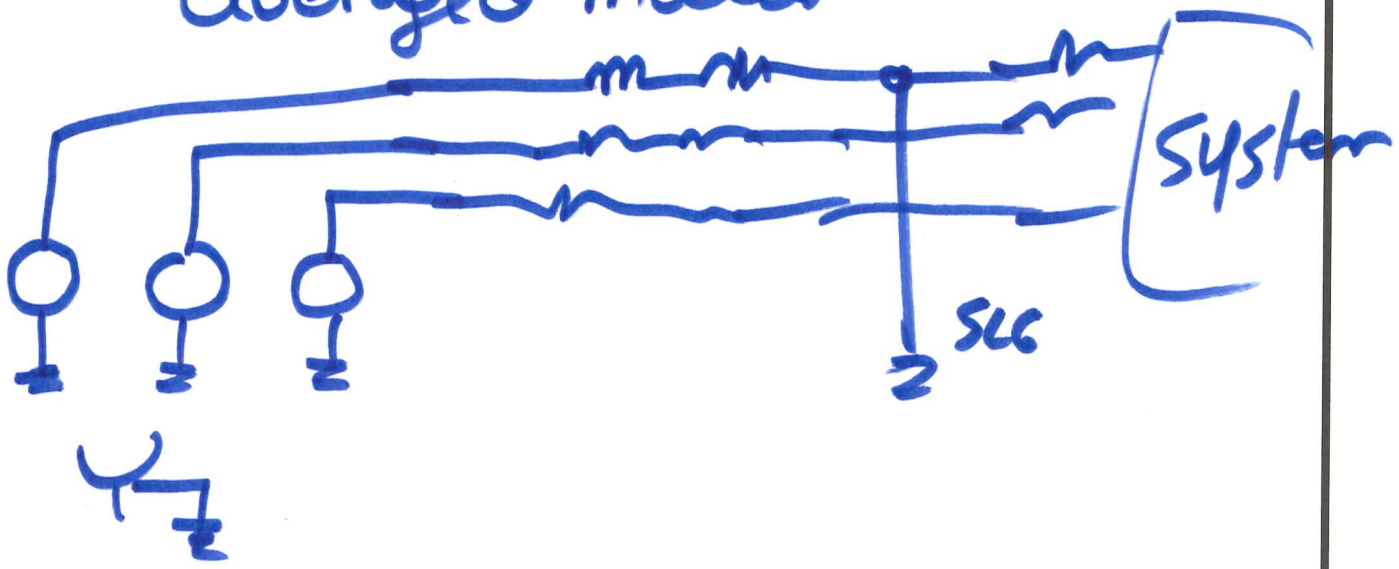
ECE 404-TD / 504-TD

ST: T&D APPLICATIONS OF VOLTAGE SOURCE CONVERTERS

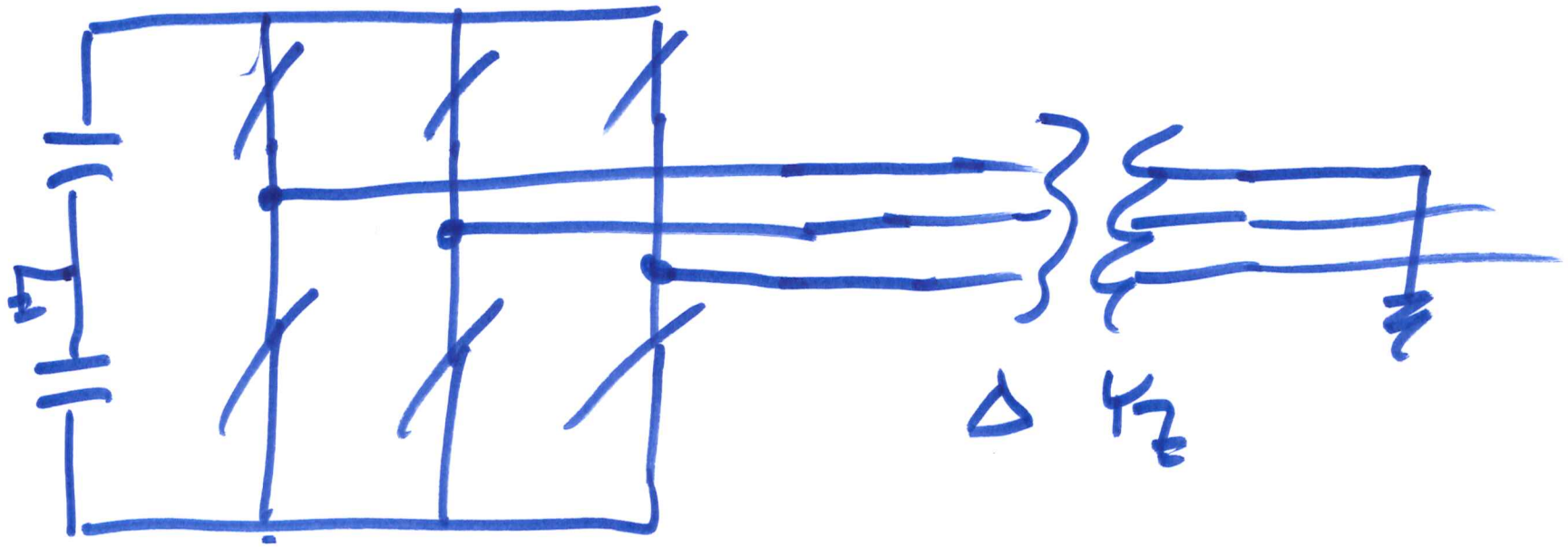
SESSION no. 44

- Doing fault studies with VSC

→ Be careful with averaged model



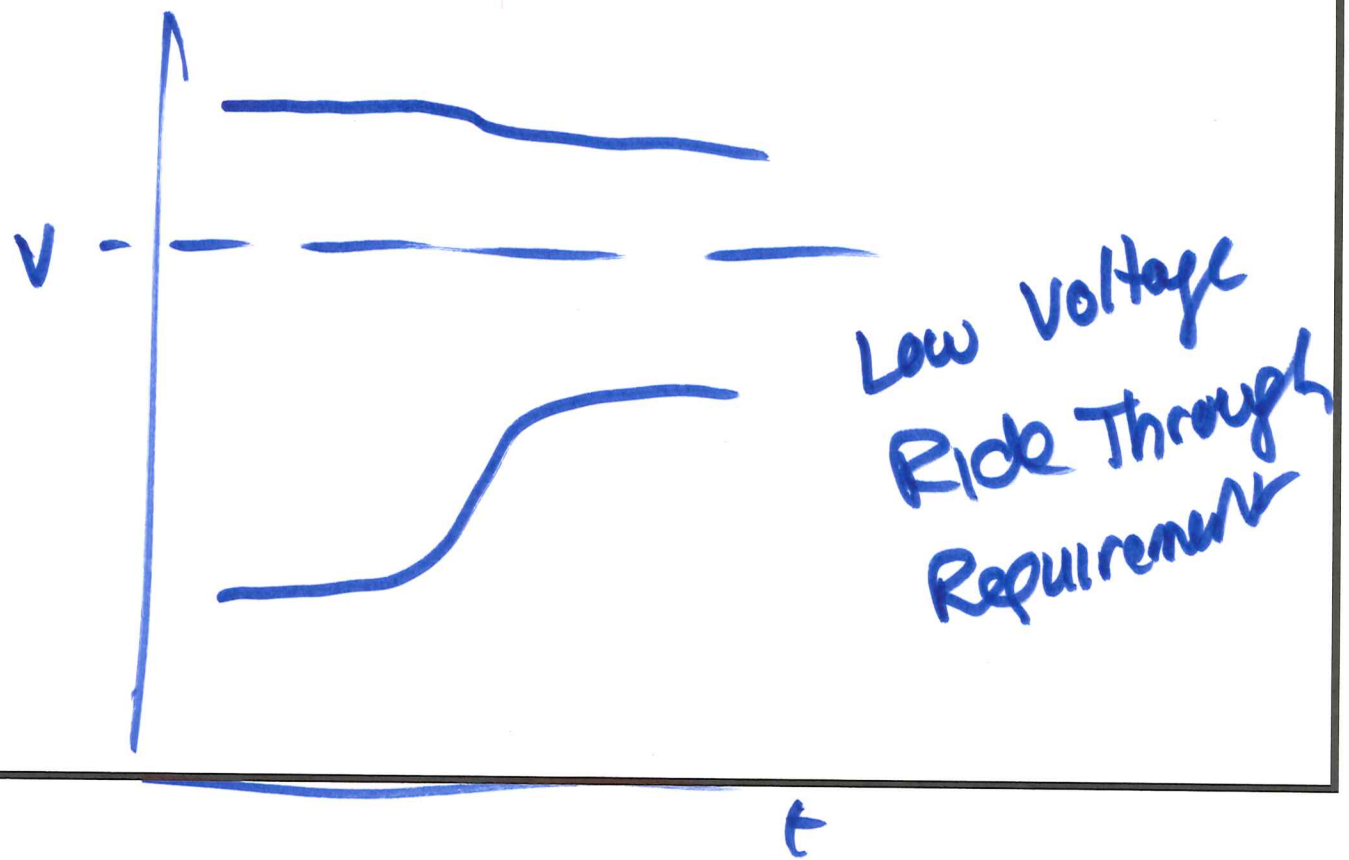
3Φ Bridge

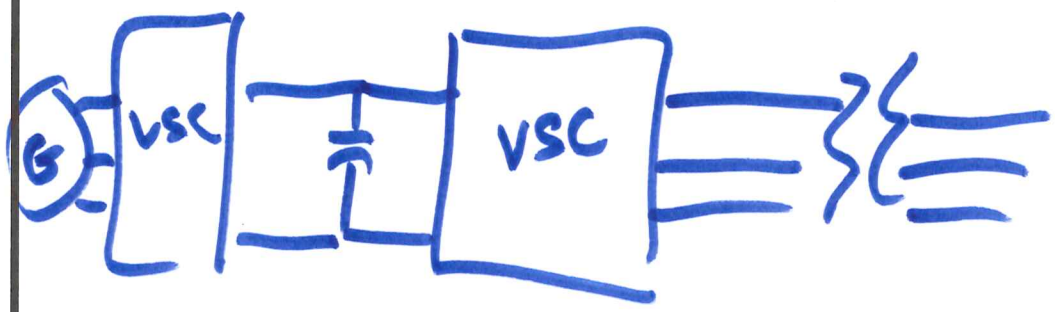


- When a fault on ac system occurs

Assumptions for this discussion

- It is not in the immediate converter system





Type 4

- converter controls need to identify as a fault
  - V_d, V_q at PCC compared to tolerances
    - and if double frequency term gets large
  - monitor current magnitudes stay with in limits
    - Limits associated with I_{DREF}, I_{QREF}

In response to fault
a change control

I_{dref}, I_{qref} not
set to maintain P, Q
at prefault setting

- Instead go to a current
limiting mode

→ keep I_{gc} w/in
limits → getting
Power out of DC
link

- maybe supply Q to boost voltage

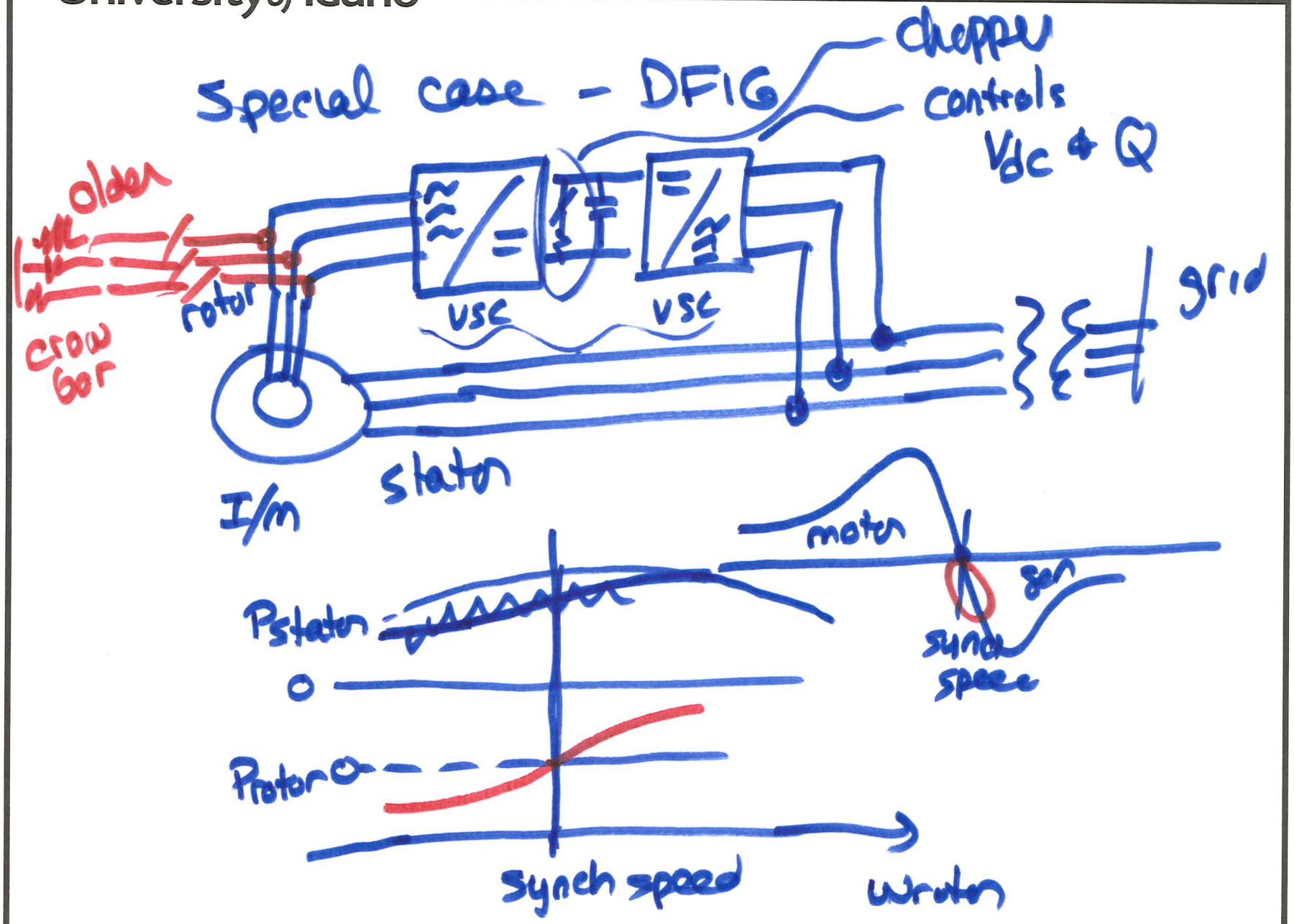
- most cases
  - → current ~~with~~ magnitude will be slightly more than rated current
  - → Balanced 3Ø or close to balanced
  - → power factor will have converter possibly supplying VARs

based on controls, not system impedances

Current reference either to

- I_{dref}, I_{qref} } for inner current regulators

- or in some cases a current regulated PWM similar to active


Special case - DFIG
chopper controls
Vdc & Q
older
crow bar
rotor
VSC
VSC
grid
I/M
stator
motor
gen
Pstator
0
Protor
synch speed
synch speed
ωrotor

This course

- VSC converter basics
  - switching power pole
    - → DC/DC converter
  - PWM options
    - single phase ½ bridge dc-ac
    - 3Ø Bridge
      - sine Δ
      - space vector

multilevel converters
- NPC + some inc levels

- MMC
  - heat sinks / losses
  - wound rotor induction machines

Control of converters
- AVERAGED models
- inner ⇔ current regulation control
  - compared averaged to switching
  - αB, dq transformation implemented in sims

- P, Q to determin
  Idref , Iqref
- V_{dc} regulation → I_{dref}
- $|V_{AC}|$ regulat. → I_{qref}
- Active harmonic filters

AE faults — response