

ECE 404-TD / 504-TD

ST: T&D APPLICATIONS OF
VOLTAGE SOURCE CONVERTERS

SESSION no. 37

$R \approx 0$ approx

$$P_{TS} = -P_{ST} = P_{out}$$

$$\theta_{vs} = 0$$

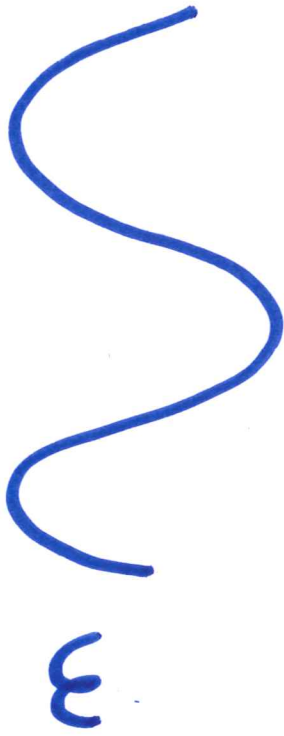
converter
to system

$$= \frac{3 |V_{T0n}| |V_{sn}| \sin(\sigma - 0)}{X}$$

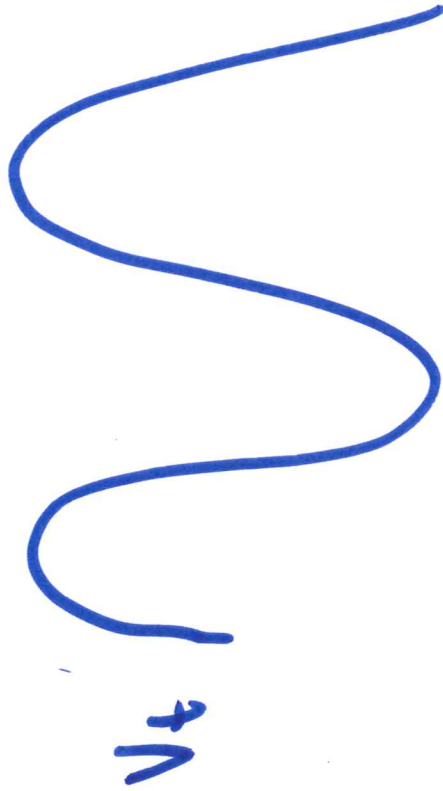
$$Q_{out} = -Q_{ST} = \frac{-3 |V_{sen}|^2 + 3 |V_{sen}| |V_{T0n}| \cos(\sigma - 0)}{X}$$

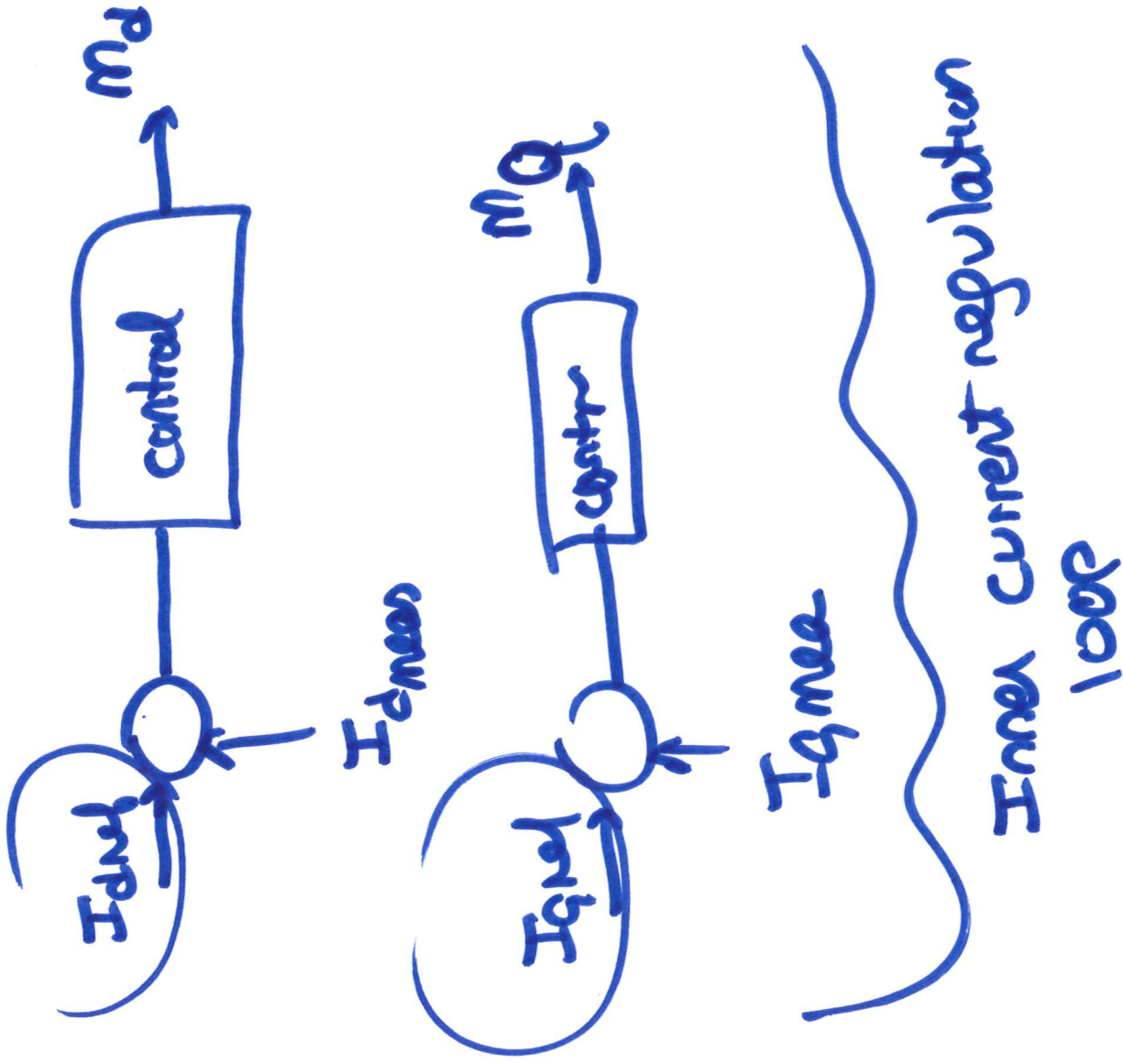
$$-90 \leq \sigma \leq 90$$

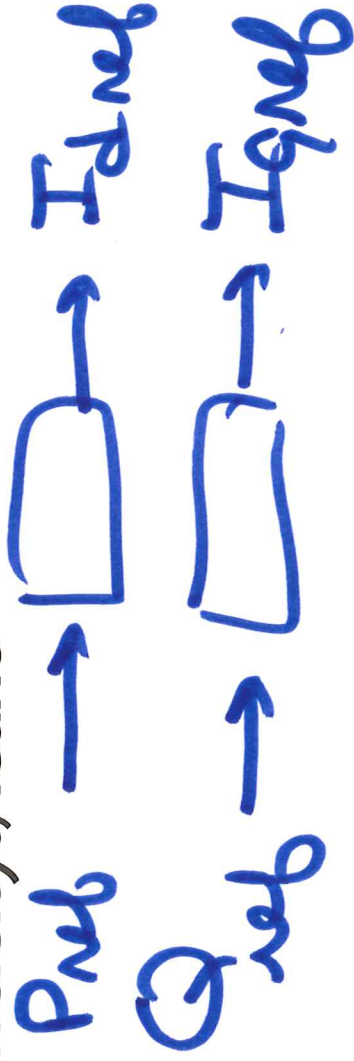
$$\cos(\sigma - 0) = \cos(\sigma - 0)$$



$\frac{2\pi N}{2}$ ↓







$$V_o, I_o = 0$$

$$V_{sq} = 0$$

$$P_i = \frac{3}{2} (V_{sd} \cdot i_d + V_{sq} \cdot i_q + V_{so} \cdot i_o)$$

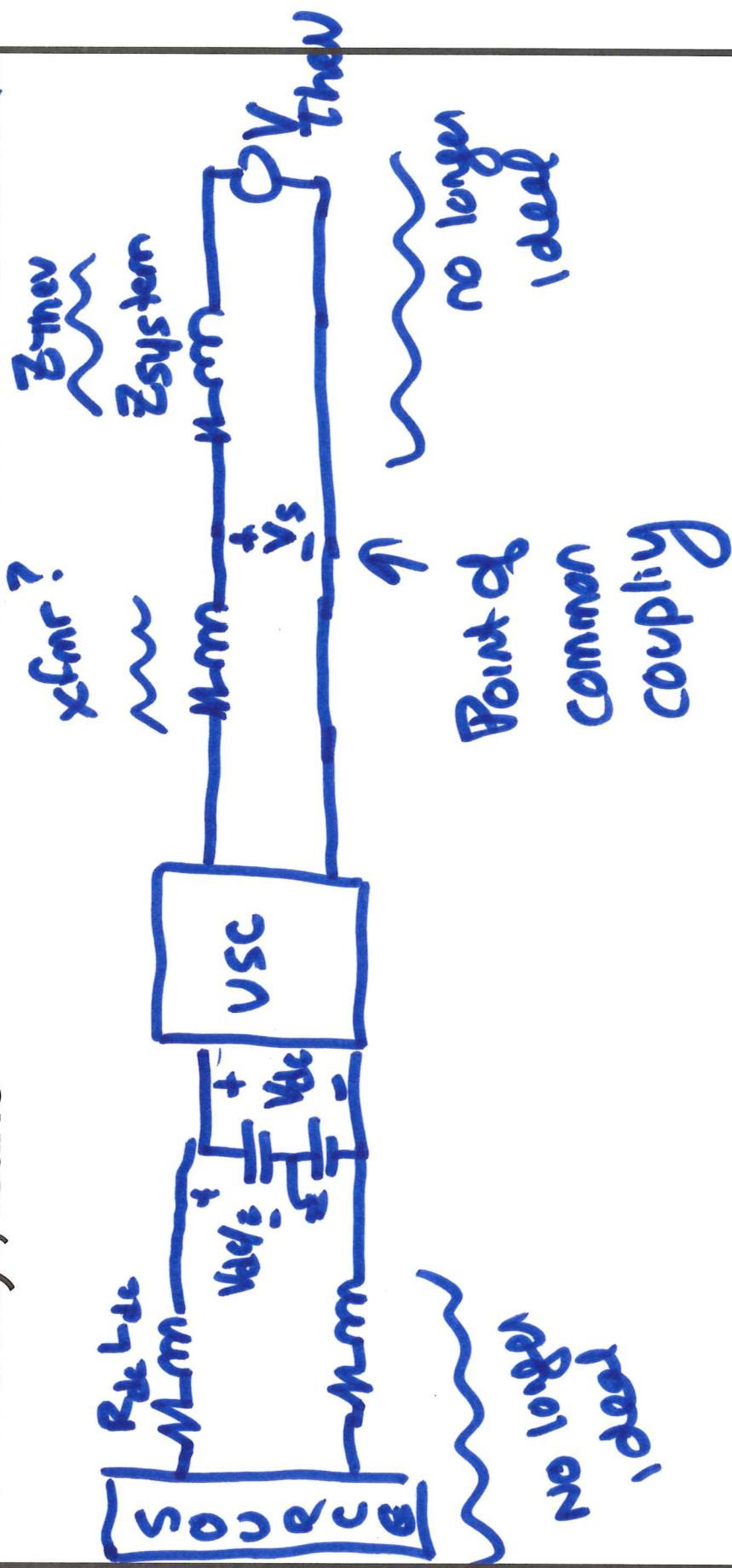
$$i_{dref} = \frac{P_{ref}}{V_{sd}} \cdot \frac{2}{3}$$

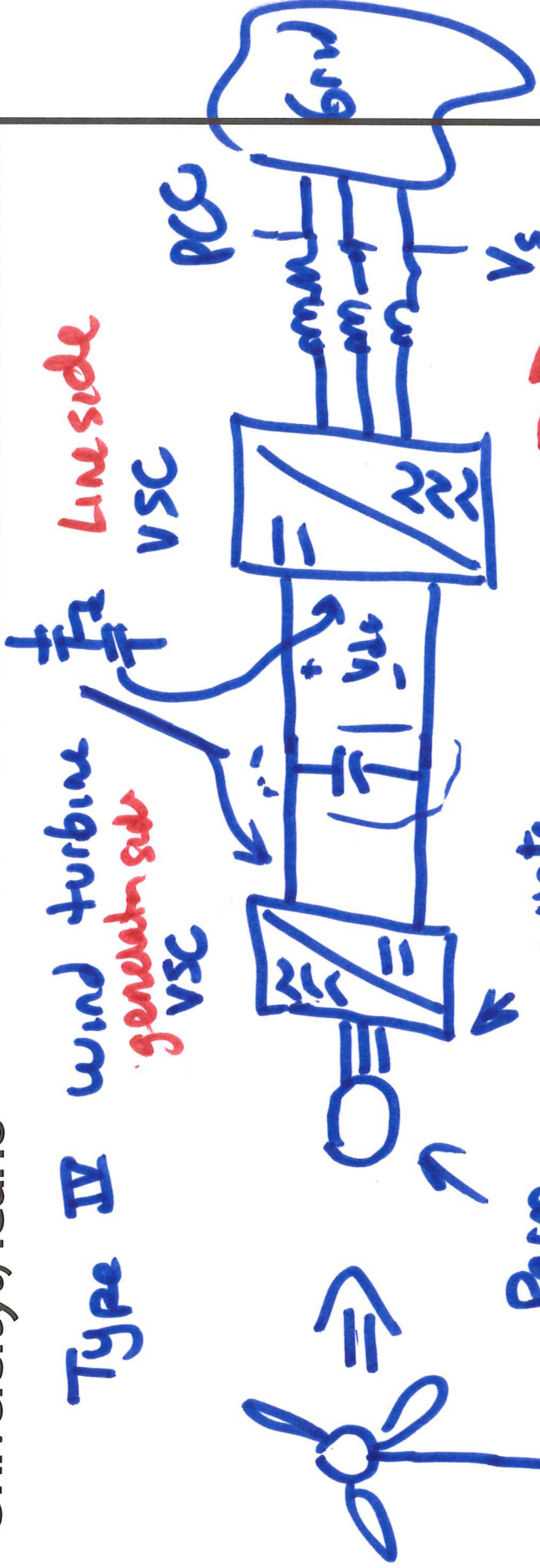
$$\dot{Q} = \frac{2}{3} (V_{sd} i_q - V_{sq} i_d)$$

$\rightarrow 0$
 due to ref in PLL
 for freq tracking

$$i_{q,ref} = \frac{2}{3} \frac{Q_{ref}}{V_{sd}}$$

~~Control~~
 Outer control
 with open loop P, Q
 so converter tracks them





Type IV wind turbine
 generator side VSC
 line side VSC

Perm magnet
 Synchron machine

regulate P, Q on ac
 side to power
 max from generator

P_{out} is
 slaved to
 wind turbine
 output

θ_{out} set to
 specific PF with

$P_{out} \rightarrow$ unity