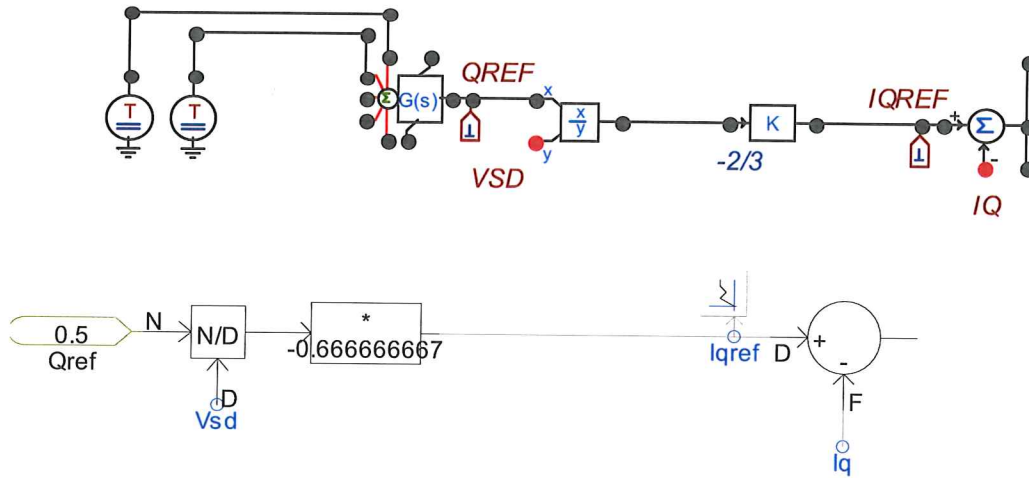


ECE 404-TD / 504-TD

ST: T&D APPLICATIONS OF  
VOLTAGE SOURCE CONVERTERS

SESSION no. 39

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L39



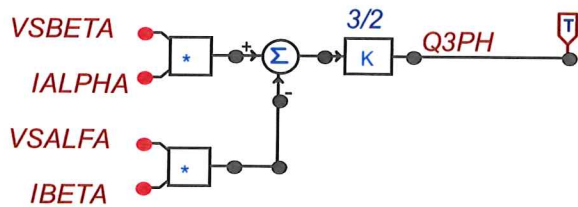
- Note, that the same error shows up in the alpha-beta based reactive power calculation example too:

$$P_{3ph} = \frac{3}{2} (v_{\alpha} i_{\alpha} + v_{\beta} i_{\beta} + v_0 i_0)$$

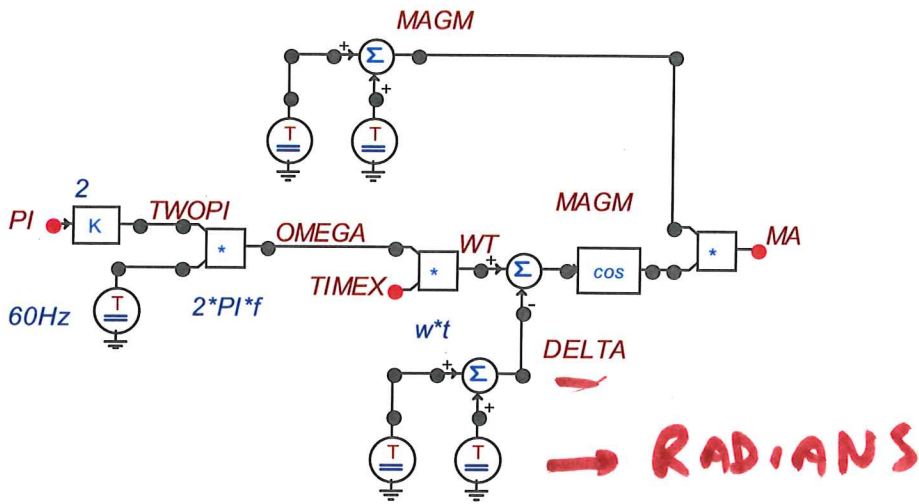
- This is implemented correctly in the files

$$Q_{3ph} = \frac{3}{2} (v_{\beta} i_{\alpha} - v_{\alpha} i_{\beta})$$

- The simulation files implement the negative of this.



- Another frequent question:

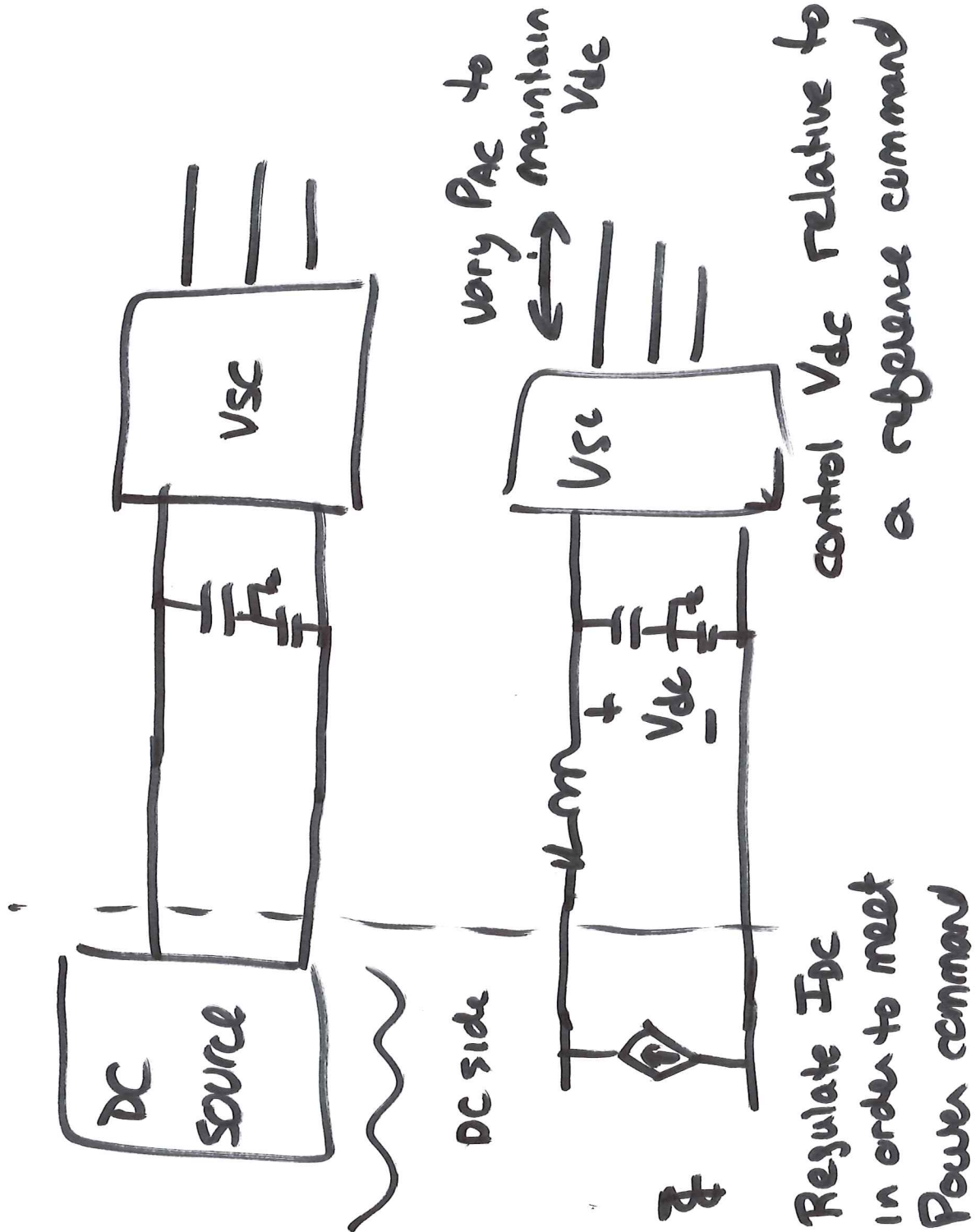


Note that this implements:  $MAGM \cdot \cos(\omega \cdot t - \delta)$

While in EMTDC, I implemented it as:

$$MAGM \cdot \cos(\omega \cdot t + \delta)$$

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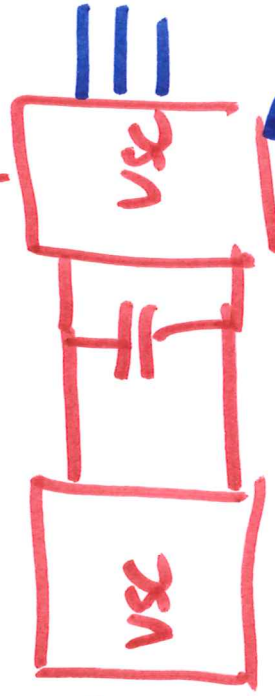


# Type 4 wind turbine

- 2 converters

- generator side converter

grid side converter



PM Synchron gen

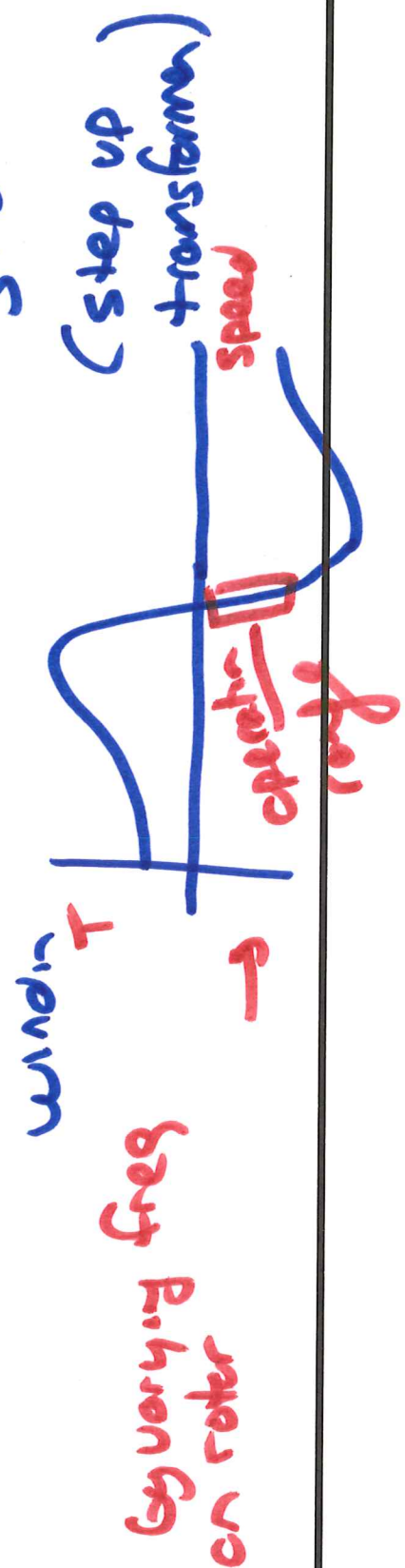
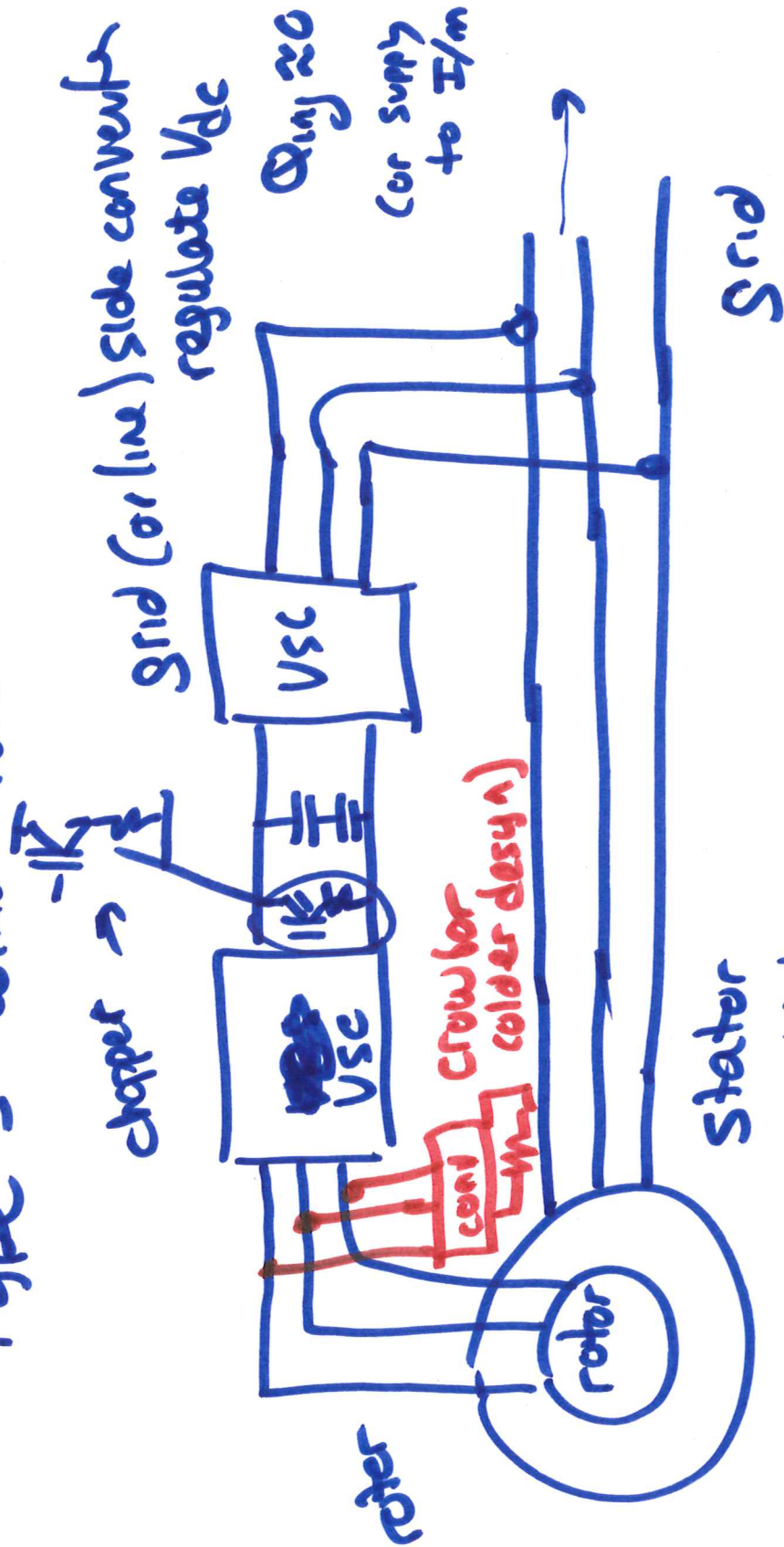
(some installations have simpler rectifiers)

- const  $V_{dc}$

- const pf

( $\alpha = 0$  often)

# Type 3 wind turbine



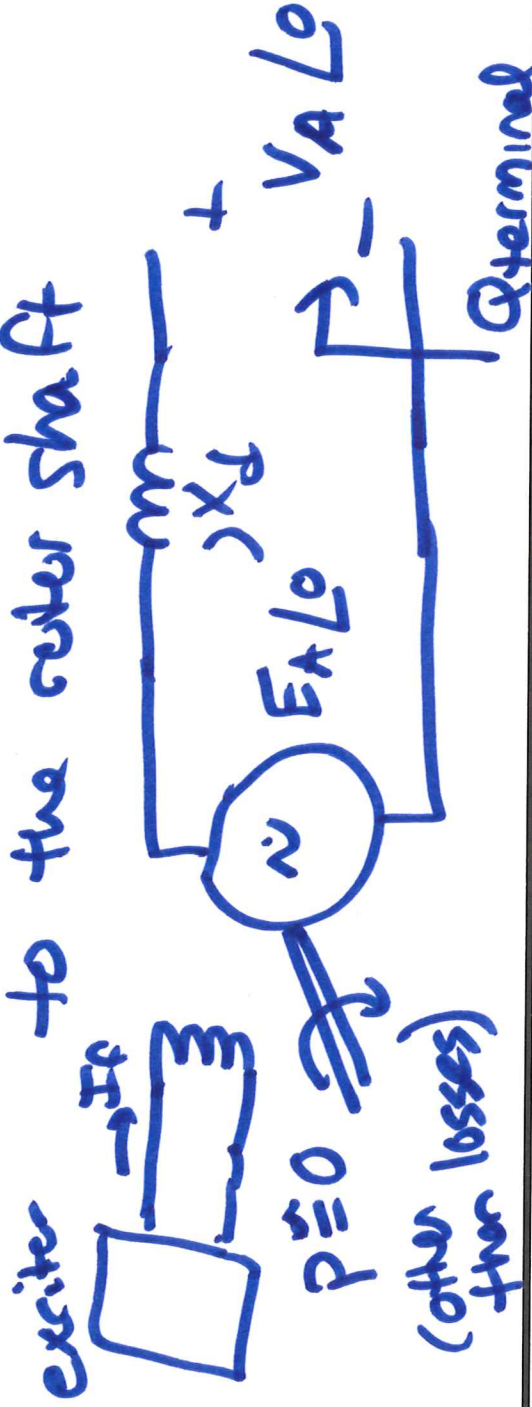


$$Q_{\text{term pu}} = -\frac{|V_A|^2}{X_D} + \frac{|V_A||E_A| \cos(\phi)}{X_D}$$

→ by "controlling"  $|E_A|$  can supply  
or ~~absorb~~ absorb reactive power

# Static Synchronous Compensator (STATCOM)

- Synchronous Condenser  
Synchronous machine without a source or a load connected to the rotor shaft





# Power electronic equivalent

- VSC solution

## AVERAGED MODEL (Per phase)

