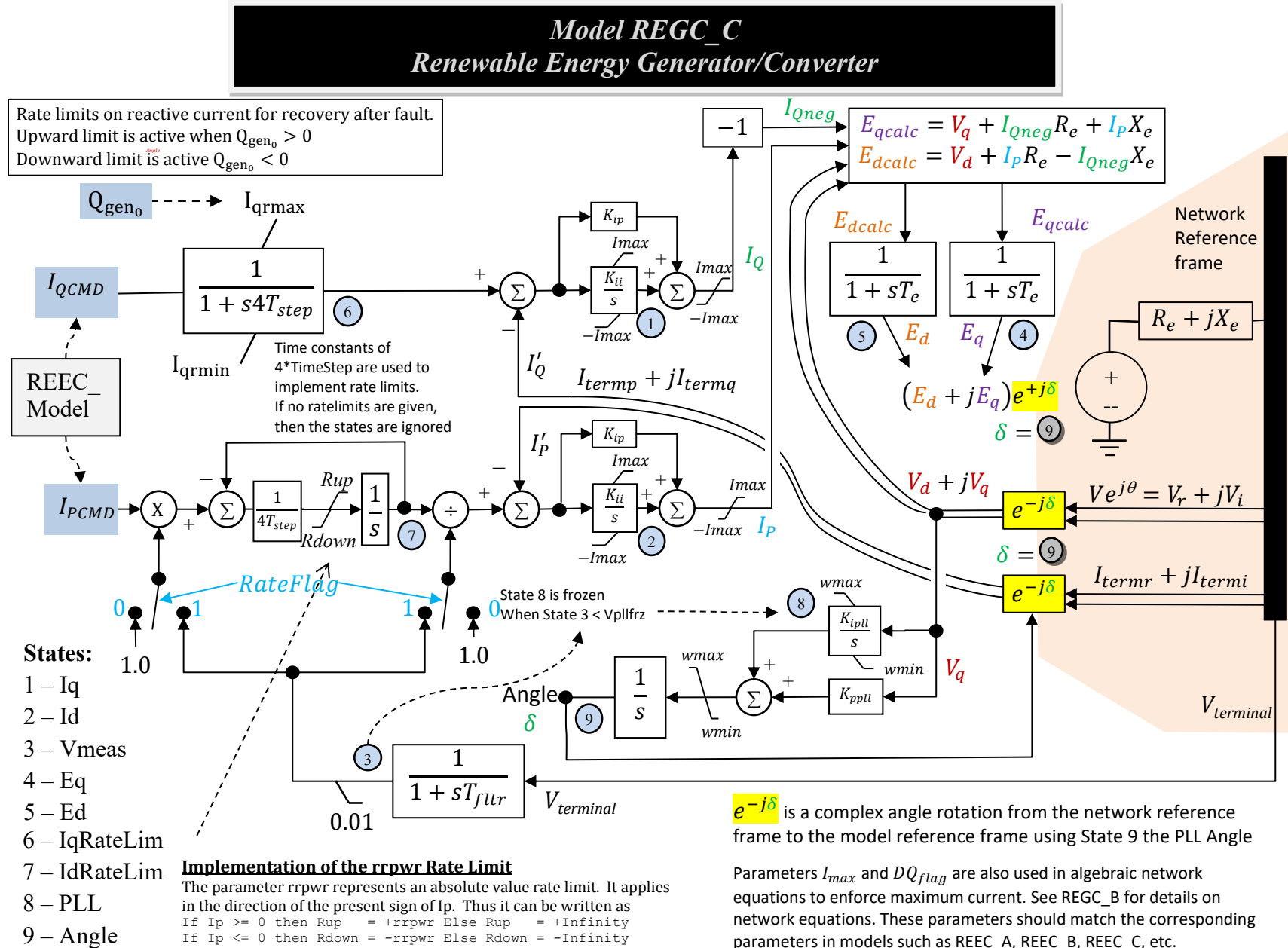
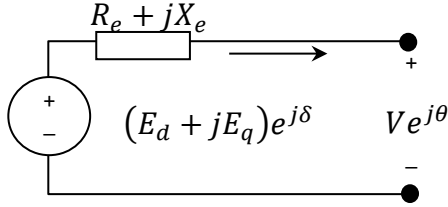


Machine Model REGC_C



Network Boundary Equations Explanation

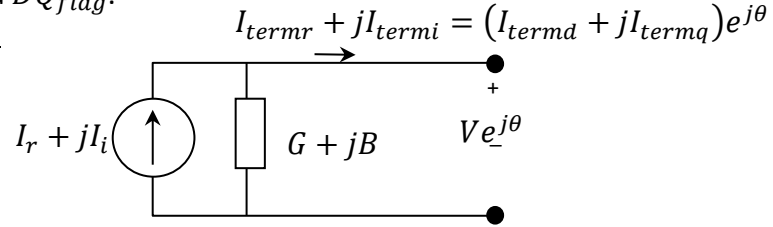
Model States: E_d, E_q, δ Model Parameters: R_e, X_e, I_{max} , and DQ_{flag} .



$$G + jB = \frac{1}{R_e + jX_e}$$

$$G = \frac{R_e}{R_e^2 + X_e^2}$$

$$B = \frac{-X_e}{R_e^2 + X_e^2}$$



At start of each algebraic solution reset and assume that the current limit is not being hit and thus Norton current on the network reference frame is equal to the following.

$$I_r = [(E_d G - E_q B) \cos(\delta) - (E_d B + E_q G) \sin(\delta)]$$

$$I_i = [(E_d B + E_q G) \cos(\delta) + (E_d G - E_q B) \sin(\delta)]$$

During the algebraic solution if the terminal current exceeds the maximum current limit (I_{max}), then the algebraic network equations transition to a constant current instead for the remainder of that algebraic solution. Calculation of the terminal current is as follows (by first rotating the Norton currents from the network reference frame to a dq reference frame using the bus voltage angle).

$$I_{termd} = I_r \cos(\theta) + I_i \sin(\theta) - GV$$

$$I_{termq} = I_i \cos(\theta) - I_r \sin(\theta) - BV$$

If this exceeds the maximum total current ($I_{termd}^2 + I_{termq}^2 > I_{max}^2$), then calculate parameters I_{maxd} and I_{maxq} based on DQ_{flag} .

DQFlag <> 0	DQFlag = 0
If $abs(I_{termd}) > I_{max}$ then If $I_{termd} < 0$ then $I_{maxd} = -I_{max}$ Else $I_{maxd} = +I_{max}$ $I_{maxq} = 0$ Else $I_{maxd} = I_{termd}$ If $I_{termq} < 0$ then $I_{maxq} = -\sqrt{I_{max}^2 - I_{termd}^2}$ Else $I_{maxq} = +\sqrt{I_{max}^2 - I_{termd}^2}$	If $abs(I_{termq}) > I_{max}$ then If $I_{termq} < 0$ then $I_{maxq} = -I_{max}$ Else $I_{maxq} = +I_{max}$ $I_{maxd} = 0$ Else $I_{maxq} = I_{termq}$ If $I_{termd} < 0$ then $I_{maxd} = -\sqrt{I_{max}^2 - I_{termq}^2}$ Else $I_{maxd} = +\sqrt{I_{max}^2 - I_{termq}^2}$

When the current enforcement is active the I_{maxd} and I_{maxq} are modeled as a current injection at the terminal. On the network reference frame, the terminal currents are.

$$I_{rterm} = I_{maxd} \cos(\theta) - I_{maxq} \sin(\theta)$$

$$I_{iterm} = I_{maxd} \sin(\theta) + I_{maxq} \cos(\theta)$$