

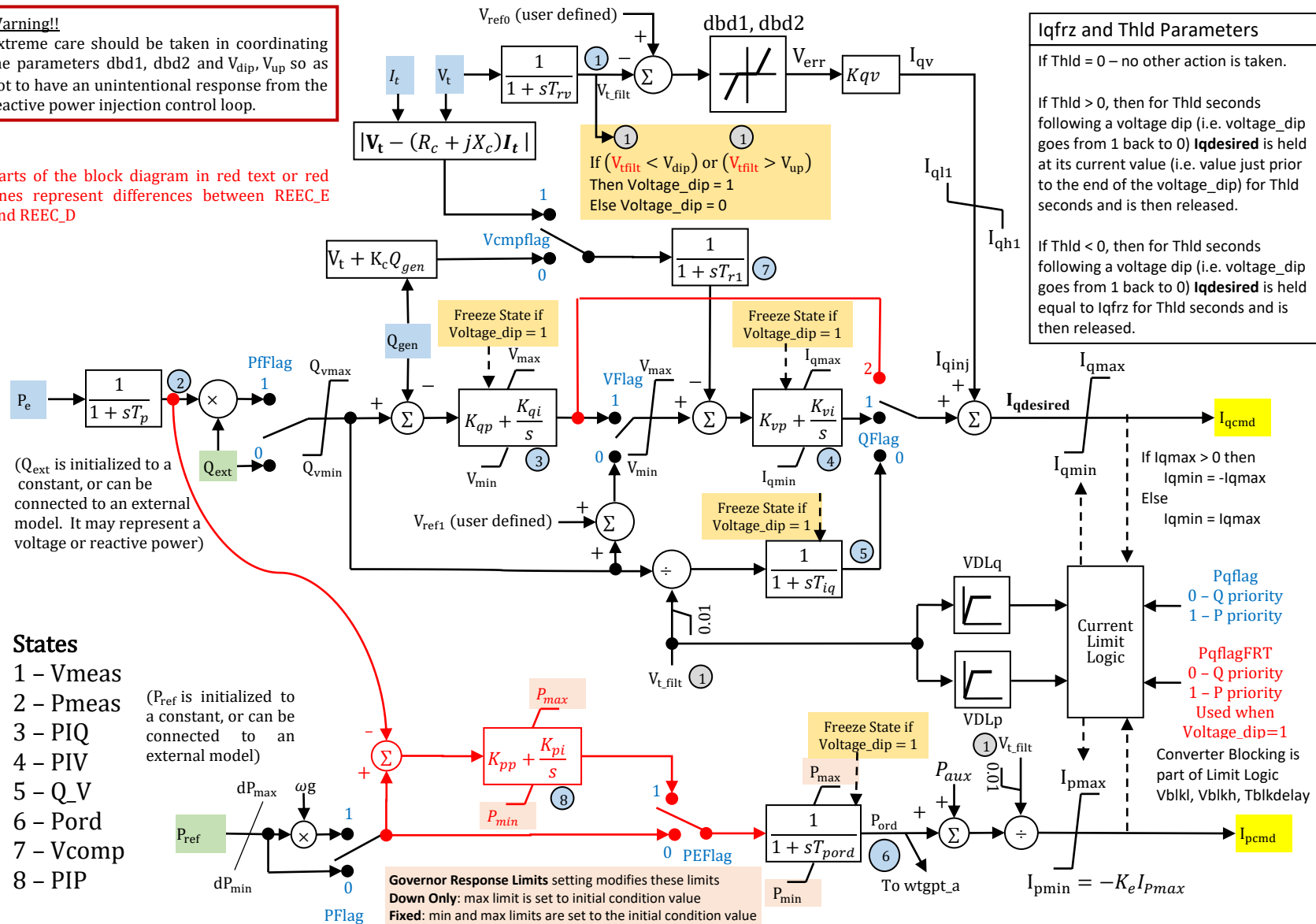
Exciter REEC_E

Renewable Energy Electrical Control Model REEC_E

Warning!!

Extreme care should be taken in coordinating the parameters dbd1 , dbd2 and V_{dip} , V_{up} so as not to have an unintentional response from the reactive power injection control loop.

Parts of the block diagram in red text or red lines represent differences between REEC_E and REEC_D



Blocking Logic: At very low voltages at the terminals of the converter the converter power electronic will block. Although it may be possible to model inverter blocking by properly parameterizing the VDL tables and the Thld and Thld2 parameters, this may not be entirely desirable since those parameters are more typically used for modeling the voltage dependence of the inverter current limits and the voltage-dip logic, which can be independent of blocking. The parameters Vblk, Vblkh, and Tblkdelay are completely independent of all the other parameters and are to be used for modeling converter blocking

- (a) If measured voltage (State 1) becomes $< V_{blk}$ or $> V_{blkh}$, then $I_{qmax} = I_{pmax} = I_{qmin} = I_{pmin} = 0$ and thus both the I_{pcmd} and $I_{qcmd} = 0$.
- (b) Tblk_delay – once the converter comes out of the blocking mode (i.e. after blocking, state 1 recovers back within the range of $V_{blk} < V_{t_filt} < V_{blkh}$) the current limits are released only after Tblkdelay seconds (i.e. $I_{qmax} = I_{pmax} = I_{qmin} = I_{pmin} = 0$ for another Tblk_delay seconds after the voltage recovers outside of the blocking range).

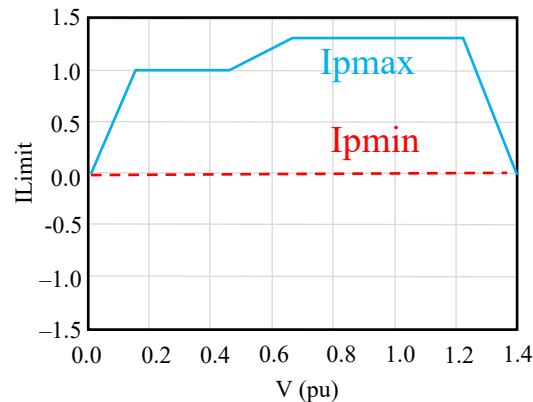
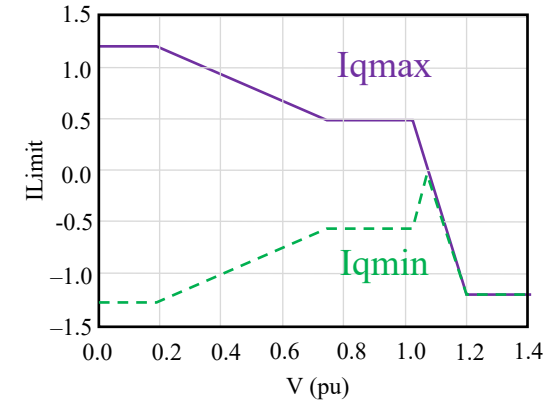
Example VDLp and VDLq tables showing negative Iq5 value

Vp1=0.00; Vp2=0.15; Vp3=0.46; Vp4=0.67; Vp5=1.21; Vp6=1.40
Ip1=0.00; Ip2=1.00; Ip3=1.00; Ip4=1.30; Ip5=1.30; Ip6=0.00

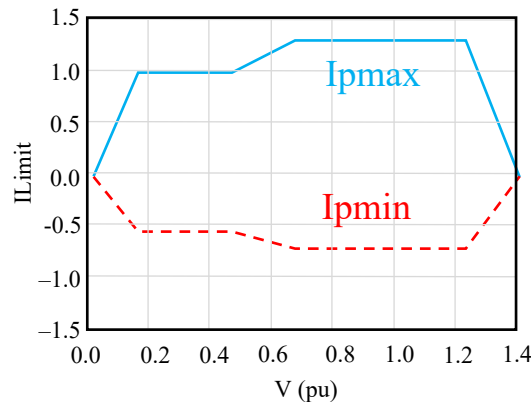
Vq1=0.00; Vq2=0.20; Vq3=0.72; Vq4=1.00; Vq5= 1.20; Vq6= 1.40
Iq1=1.20; Iq2=1.20; Iq3=0.50; Iq4=0.50; Iq5=-1.20; Iq6=-1.20

Figures at bottom show different values of Ke parameter.

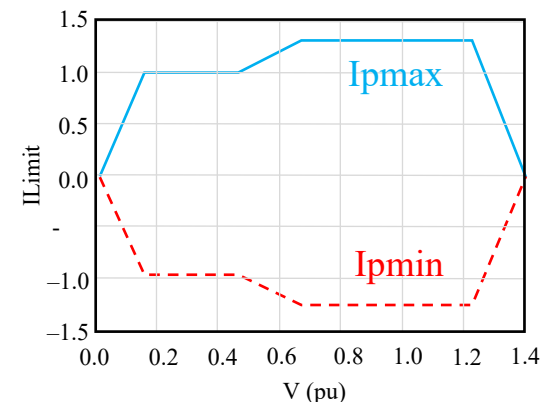
$$I_{pmin} = -K_e I_{pmax}$$



VDLp Table when **Ke = 0.0**



VDLp Table when **Ke = 0.5**



VDLp Table when **Ke = 1.0**

Current Limit Logic Psuedo Code

The following pseudo-code describes how the values for `Ipmax`, `Ipmin`, `Iqmax`, and `Iqmin` are updated. This is done independently of blocking logic described previously.

```
If Blocked then begin // see logic above for when blocking is implemented
    Ipmax = 0
    Ipmin = 0
    Iqmax = 0
    Iqmin = 0
End
Else begin
    Voltage_Thld2TimerActive = special boolean related to timer
    local_V = StateVtfilter // Vt State 1
    if VDL1 table is empty then Iqmax = 1E10
    else Iqmax = lookup from VL1 table using local_V
    if not Voltage_Thld2TimerActive then begin
        if VDL2 table is empty then Ipmax = 1E10
        else Ipmax = lookup from VDL2 table using local_V
    end
    if PQFlag = 0 then begin // Q priority [default]
        If Imax < Iqmax Then Iqmax = Imax
        if Iqmax < 0 then Iqmin = Iqmax // special handling
        Else Iqmin = -Iqmax
        if not Voltage_Thld2TimerActive then begin
            local_I = Sqr(Imax) - Sqr(Iqcmd)
            if local_I < 0 then local_I = 0
            else local_I = sqrt( local_I )
            if local_I < Ipmax Then Ipmax = local_I
        end
        Ipmin = -Ke*Ipmax
    end
    else Begin // P priority
        if not Voltage_Thld2TimerActive then begin
            if Imax < Ipmax Then Ipmax = Imax
        end
        Ipmin = -Ke*Ipmax
        local_I = Sqr(Imax) - Sqr(Ipcmd)
        if local_I < 0 then local_I = 0
        else local_I = sqrt( local_I )
        if local_I < Iqmax Then Iqmax = local_I
        if Iqmax < 0 then Iqmin = Iqmax // special handling
        Else Iqmin = -Iqmax
    end
end
end
```