Given a simple system like the one in Figure 1 I wish to solve the power flow using the Flexible General Branch Model.

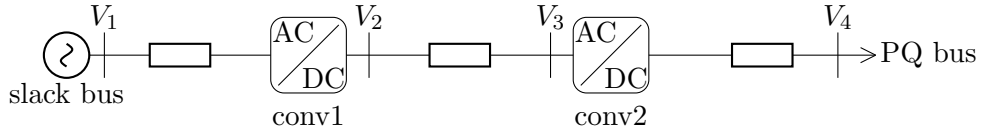

Figure 1: Simplified system with the AC/DC converter

Now, the consideration is that converter 1 (conv1) operates following control mode 5 whereas converter 2 (conv2) uses the control mode 2. Thus, $|V_2|$ and the active power leaving bus 3 that goes through conv2 (we will call it P_f) correspond to data I specify.

As I understand it, I encounter the next unknowns: δ_2, δ_3, δ_4, $|V_3|$, $|V_4|$, $m_{a,1}$, $B_{eq,2}$ and $\theta_{sh,2}$. My guess is that the control variable m_a has to be found only for conv1 because we control $|V_2|$ while B_{eq} and θ_{sh} are related to conv2 in this case due to the fact that it operates in control mode 2.

I then take into consideration equations 1 and 2 for buses 2, 3 and 4:

$$\sum P = 0, \tag{1}$$

$$\sum Q = 0. \tag{2}$$

So there are two equations left to construct a system of 8 equations and 8 unknowns. Let's say i_{34} is the current leaving bus 3 in direction to bus 4. As a result of that we have:

$$V_3 i_{34}^* = P_f + j0. \tag{3}$$

To my surprise, the jacobian involved in solving the nonlinear system of equations becomes singular.