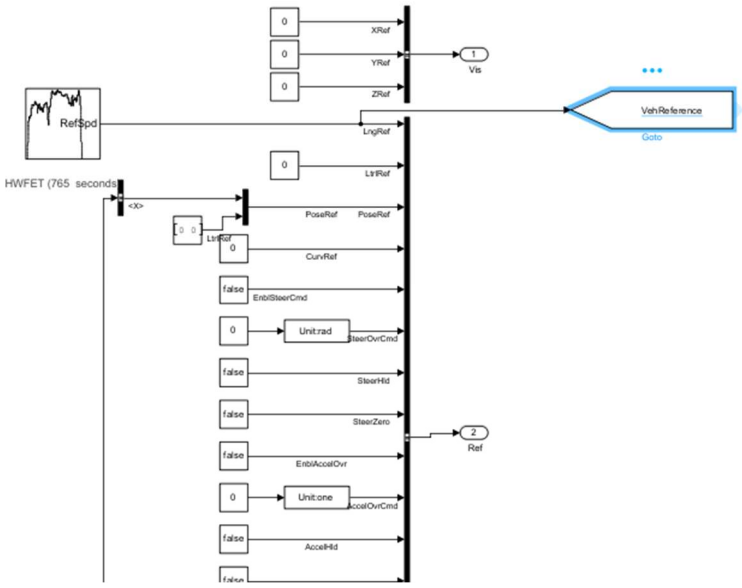
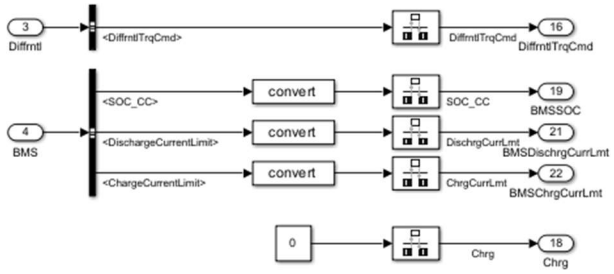
How to run the Simulation

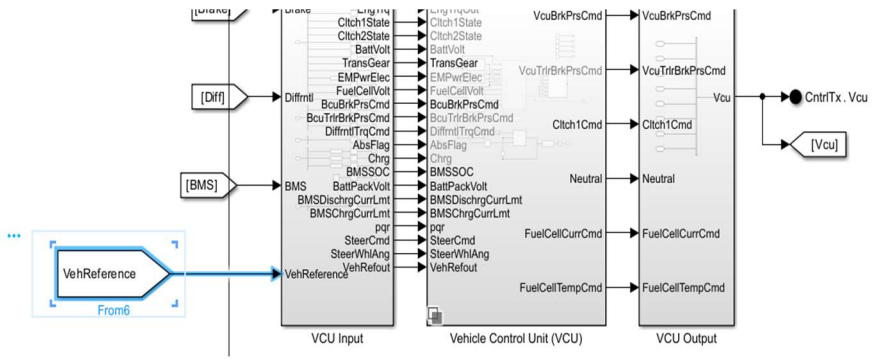
Step 1: Using the VVC app, open the file ‘myEVehicle_end’.

Step2: In the Scenario>>Reference generator, add a Goto block to Reference signal to extract the reference signal. Name it ‘VehReference’ and make it ‘global’. Ensure to convert the units from mph to m/s.

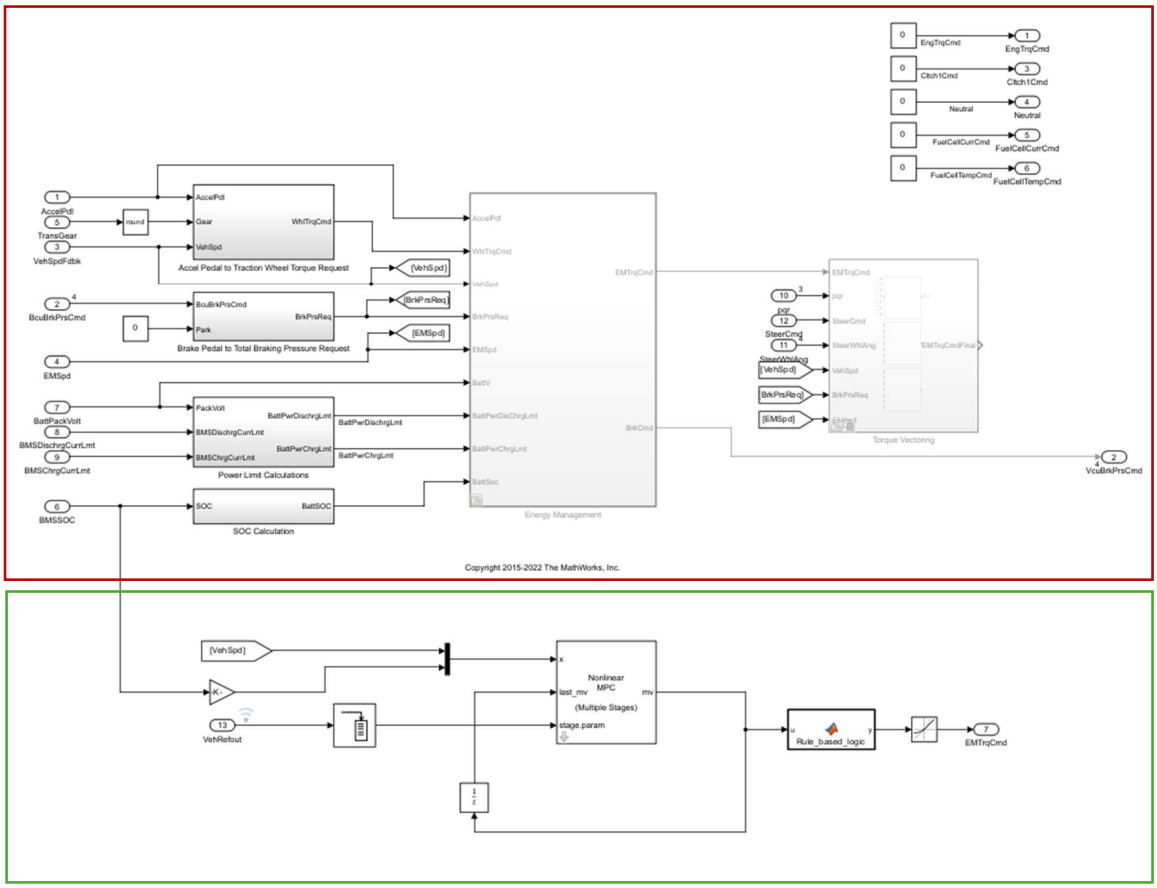


Step 3: In the input block of the Vehicle control unit (VCU). Create an extra input for the vehicle reference signal and connect a ‘FROM’ block to this input. See image below for details.





Step 4: Insert the Multistage Nonlinear MPC block, a buffer and the MATLAB function block. Set up as shown in the image below. Make sure to uncomment the 'Energy Management block'. See the picture below for a description. The red portion marks the baseline controller while the green marks the MPC controller. Set the gain block to 296.382 (this converts the battery state of charge in fractions to the value in Amp-hour(Ah))

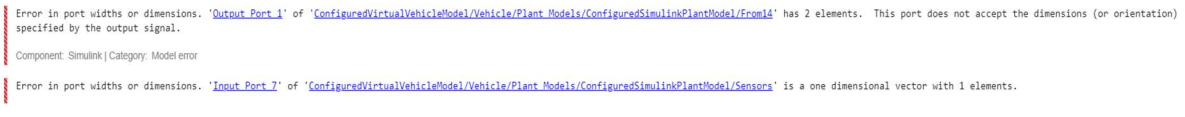


Step 6: After setting up. Ensure to run the '*multistagenlmpcobjecspecificationcodeRH.mlx*'. This will load the multistage nonlinear MPC object into the workspace. Set the buffer size to p+1 where p is the prediction horizon (in this case the prediction horizon is 40). Then run the code.

Step 7: Run the simulation.

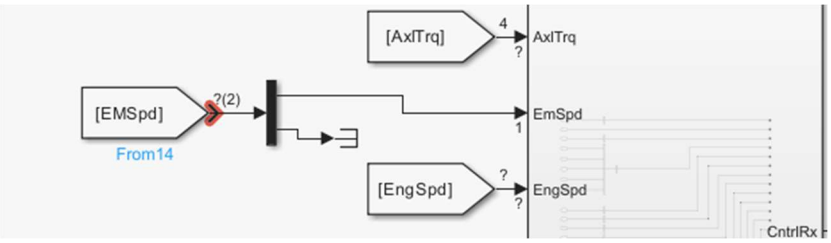
Note: If you encounter the following errors, this is how to resolve them.

- Error 1

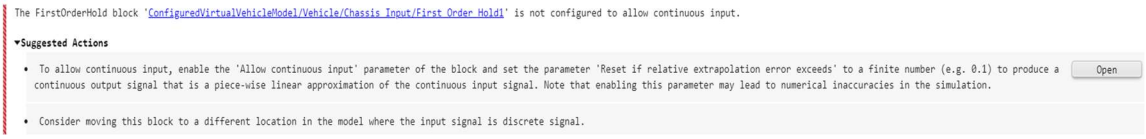


Error:Error in port widths or dimensions. 'Output Port 1' of 'ConfiguredVirtualVehicleModel/Vehicle/Plant Models/ConfiguredSimulinkPlantModel/From14' has 2 elements. This port does not accept the dimensions (or orientation) specified by the output signal.

How to resolve: Since due to the changes made, this block now expects a 1-dimensional signal, this error can be resolved by inserting a Demux. Link the first output of the Demux but terminate the other. See the image below for a description.



- Error 2

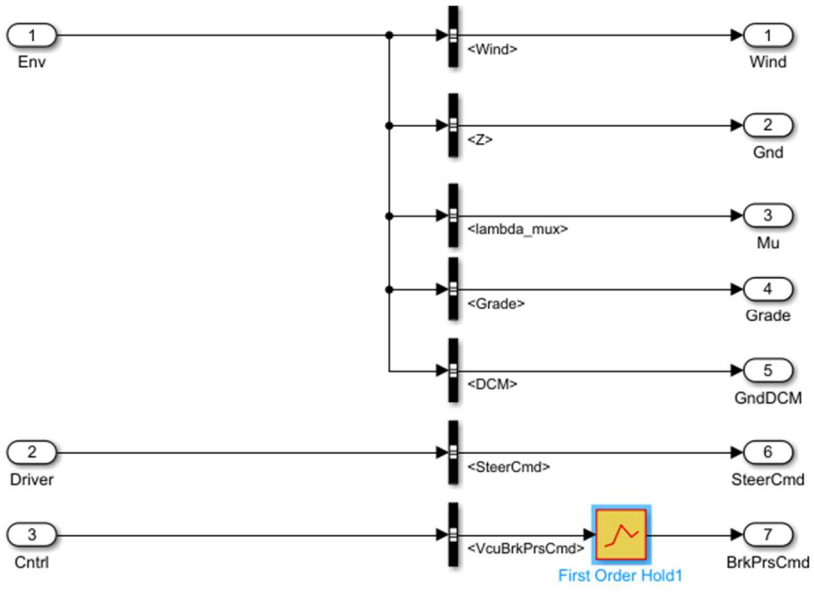


Error:The FirstOrderHold block 'ConfiguredVirtualVehicleModel/Vehicle/Chassis Input/First Order Hold1' is not configured to allow continuous input.

Suggested Actions:

To allow continuous input, enable the 'Allow continuous input' parameter of the block and set the parameter 'Reset if relative extrapolation error exceeds' to a finite number (0.1) to produce a continuous output signal that is a piece-wise linear approximation of the continuous input signal.

How to Resolve: Click on the first order hold 1 block shown in the image below. Allow continuous signal and set the ‘reset if relative extrapolation error exceeds’ to 0.1.



Ensure to re-update the model after carrying out the changes before running the simulation.