Simulink Modelling of Batteries

1 Introduction

You are an Engineer working for an Electrical Vehicle company as a battery pack system engineer. You have a very demanding manager who already launched the vehicle with range requirement without having you look into if it is feasible or not. He requires you to design the optimium battery packaging configuration, and it is important to find the lowest possible cost to fulfill the range requirements given. As a battery engineer there are several constraints which needs to be fulfilled constructing the battery pack.

- Maximum/Minimum Charge / Discharge Current: 50 A
- Maximum DC Voltage: 600 V
- Minimum DC Voltage: 200 V
- Minimum State of Charge Level: 10
- Maximum State of Charge Level: 90
- Cost: 2 USD / Cell

2 Exercise 1a

You will investigate and give a proposal for how battery pack configuration is affected by price. Plot a Paretofront where Cost is plotted on the Y-Axis and different type of pack configurations on the X-Axis (Total number of cells). You will investigate how Number of parallel connected and series connected cells affect the battery properties. We assume that vehicle weight is not affected when adding more batteries. Is the battery fulfilling all the above constraints?

3 Exercise 1b

Your manager now wants to sell the battery for a warm market. Add Auxilary load for cooling the vehicle with constant 4 kW electrical load and see how the number of cells are changing.