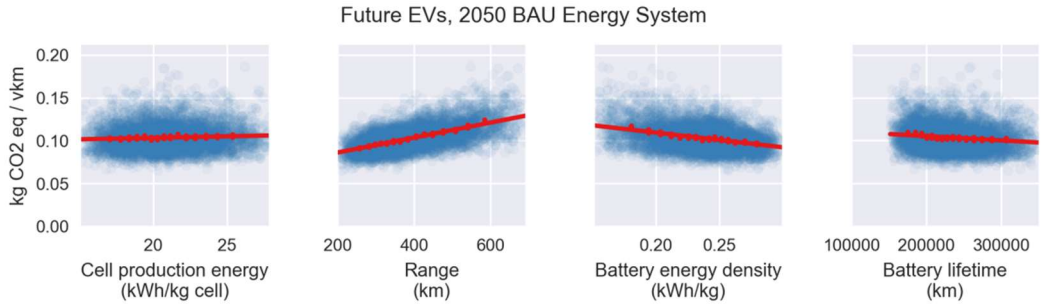
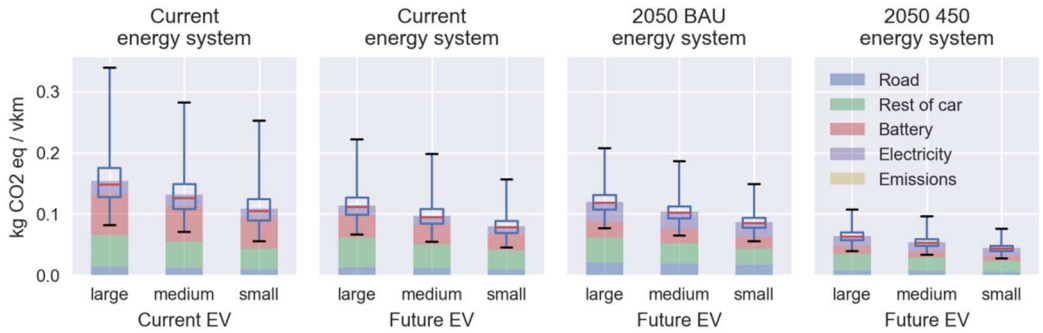
Capacity Area B2 Task 2.1 Milestone 1

Review CA A1-A3 results from phase I and complementary literature in order to expand the data sets to be used in B2.2 analysis

We have reviewed the results of capacity areas A1-A3 and also the recent literature relevant to our models of future vehicle technologies. We have also directly interacted with members of capacity areas A1-A3 to provide feedback on our input values for batteries and fuel cells. As a result of this work we have now defined simple probability distributions for all key input parameters, such as future lithium ion battery energy density, or the lightweighting potential of future passenger cars. With these probability distributions, we are able to use Monte Carlo analysis to better understand the impact of uncertain future technology performance on the results. For example, the following figure shows the global warming potential results for electric vehicles versus variation in several important battery related input parameters. Each blue dot represents the result for a single potential future electric vehicle, while the red dots and line show linear regression results for all Monte Carlo runs. We show results for electric vehicles with production year 2050 (Business As Usual energy scenario), charged with Swiss electricity according to the WWB-C scenario.



We also show global warming potential results for current and future EVs for both the current energy system as well as two potential future energy systems[1]: a 2050 Business as Usual scenario (2050 BAU), as well as a strong 450 ppm climate policy (2050 450). The stacked bar chart shows the contribution of the different parts of the car to the results, while the box plot shows uncertainty. The box represents the 50% confidence interval, while the whiskers represent the minimum and maximum results. The maximum value for current EVs is extremely high as it corresponds to an EV with very large range, poor battery energy density and high auxiliary energy demand for heating or cooling. Conversely, electric vehicles could have very low impacts in the future, especially if a low carbon energy system was used for production of the vehicles and charging of the batteries.



A similar analysis has also been performed for motorcycles, urban buses and aircraft, for which journal publications or conference proceedings are in the peer review process.

[1] EV charging mix for the current scenario is the Swiss consumption mix. For the BAU and 450 scenarios we use the Weiter wie bisher - C and Neue Energiepolitik - C&E scenarios from the Swiss Energy Perspectives 2050 respectively (Prognos 2012).