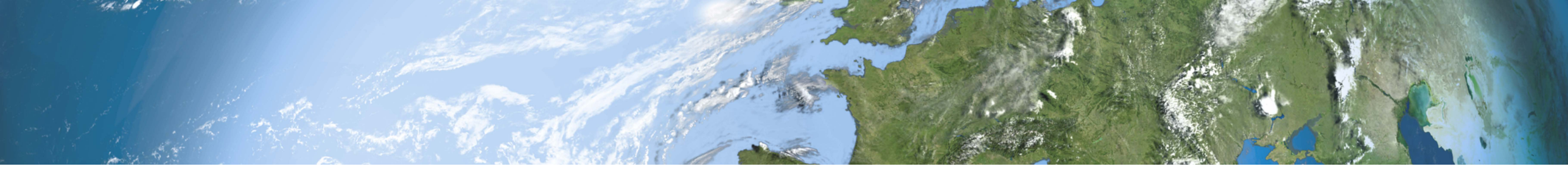


Integrated Assessment of Fuel Cell Powertrain Concepts

Background

- One main challenge for the transport sector is to reduce GHG-Emissions cost effectively in spite of the rising road transport performance. Therefore, an integrated (technological, economic and environmental) assessment of alternative powertrain concepts is required to investigate the potential of hybrid, battery and fuel cell electric vehicles.

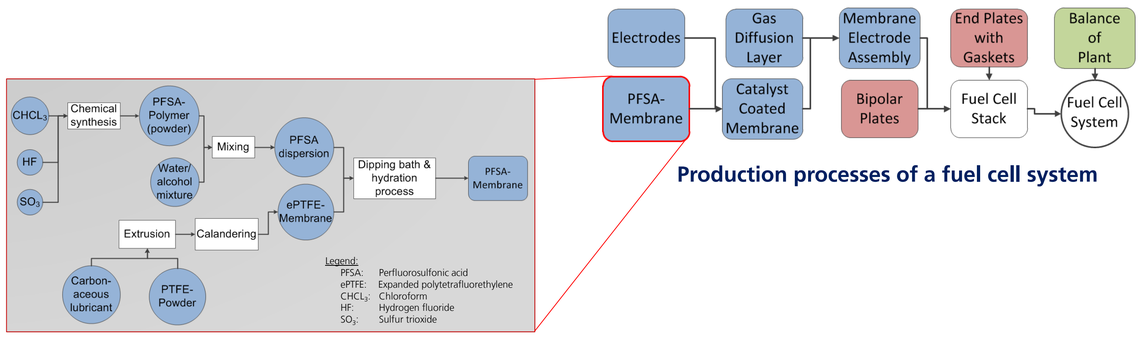
Fuel Cell System Cost Calculation

Goal

- Analysis of overall components and their share on system costs

Method

- Detailed examination of overall potential production pathways, processes and materials

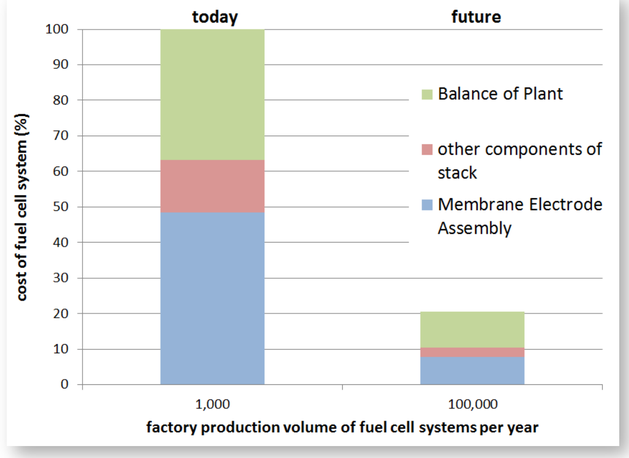


Production processes of a fuel cell system

Detailed production process of the PFSA Membrane

Result

- Cost reduction potential of about 80% due to economics of scale, reduction of cost intensive materials and development of new production pathways



Fuel cell system costs for today and for the future

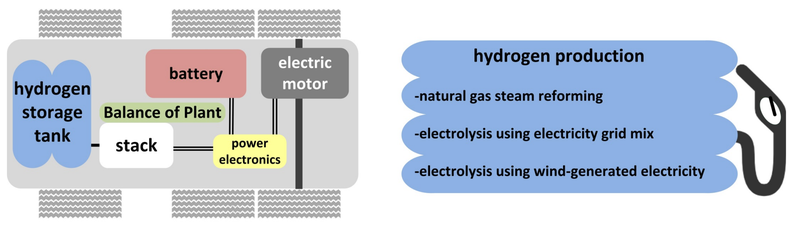
Life Cycle Assessment of Fuel Cell Powertrains

Goal

- Comparison of environmental impacts caused by production of present and future fuel cell powertrains

Method

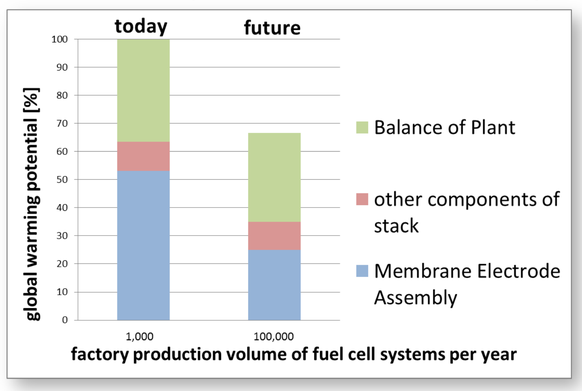
- Cradle-to-grave calculation of powertrain production, vehicle use (incl. hydrogen production) and end-of-life

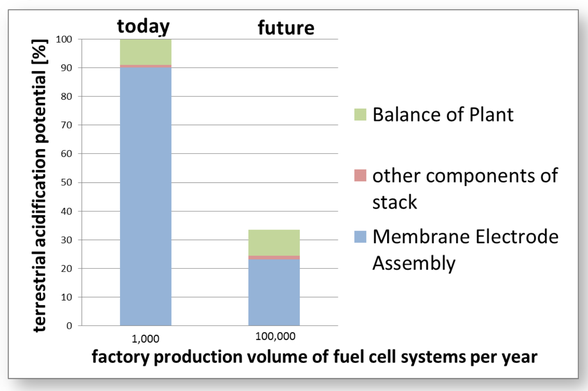


System boundaries for the LCA analysis

Result

- Significant potential of reducing environmental impacts due to lower platinum content of the membrane electrolyte assembly and platinum recycling





Environmental impacts caused by production of fuel cell systems for today and for the future

Relevant Cost of Ownership Analysis

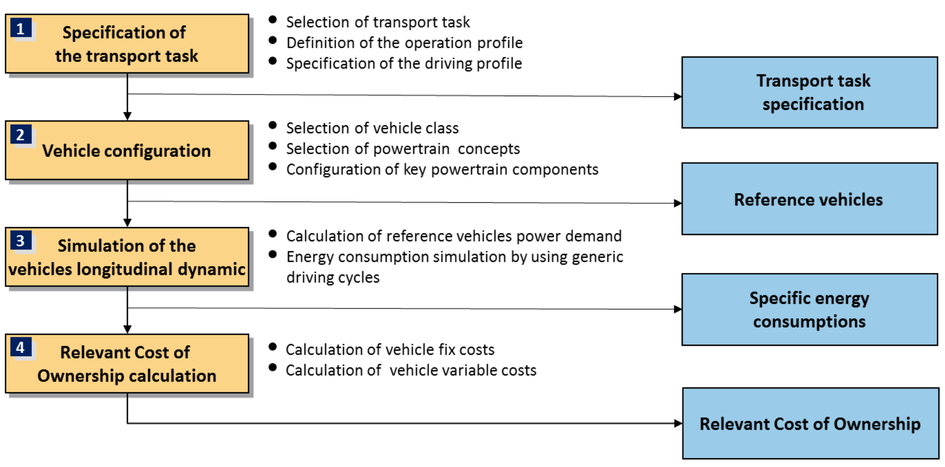
Example: Commercial Vehicles

Goal

- Comparison of ownership costs for commercial vehicles with conventional and alternative powertrains

Method

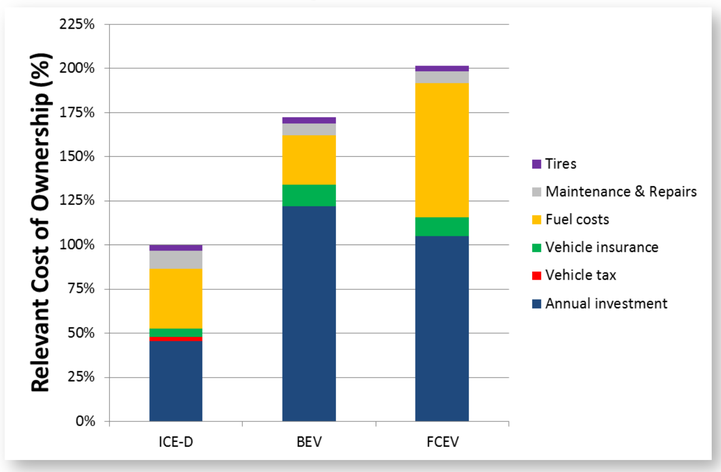
- Cost analysis based on transport task specifications and vehicle configurations



Workflow of the DLR Relevant Cost of Ownership assessment model for commercial vehicles

Result

- Cost-efficiency of BEV and FCEV powertrains depend heavily on the individual transport task requirements. The example shows that for regional delivery BEV and FCEV powertrains are currently not cost efficient



Relevant Cost of Ownership comparison for regional delivery*

*Note: ICE-D: Internal Combustion Engine – Diesel; BEV: Battery Electric Vehicle; FCEV: Fuel Cell Electric Vehicle; RCO includes only costs regarding the vehicle and not the infrastructure costs for BEV and FCEV.

*Boundary conditions: 8 years of lifetime; 39.000 km per year;
Fuel consumption: ICE-D: 17l/100km, BEV: 124 kWh/100km, FCEV: 6.1 kg H_2/100km;
Fuel costs: 1.19 €$_{2010}$/l, 0.135 €$_{2010}$/kWh, 7.41 €$_{2010}$/kg H_2;
Driving distance without refuelling: ICE-D: 732 km, BEV: 150 km, FCEV: 164 km

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