AVL

Consortium leader

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CEET Chemical Engineering and Environmental Technology

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ECO-FCEV

Energy & Cost-Efficient Fuel Cell Electric Vehicles

In the field of fuel cell-powered vehicles (FCEVs), lighter vehicles with longer range and more severe duty cycles (such as fuel cell taxis, coaches, vans, larger cars up to light duty vehicles) could lead the development due to the lower price sensitivity of their customers/buyers – compared to the truck or bus business – and the higher technology maturity. However, there are still major challenges to be overcome in the areas of energy and cost efficiency as well as durability to ultimately achieve correspondingly optimistic market penetration scenarios for FC passenger cars and light duty vehicles.

The ECO-FCEV project specifically addresses these challenges by reducing degradation and avoiding oversizing to increase energy efficiency as well as the lifetime of FC powertrains and reduce system- and vehicle-level costs in development, purchase, and use.

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Project Overview

To further improve the economy and attractiveness of FCEVs (fuel cell electric vehicles) compared to other vehicles for customers and thus to achieve an even faster market penetration of these environmentally friendly means of transport, further significant improvements are necessary. This concerns not least the following key parameters in the passenger car and light commercial vehicle sectors, which are of eminent importance for the strong R&D supply and engineering services industry in Austria:

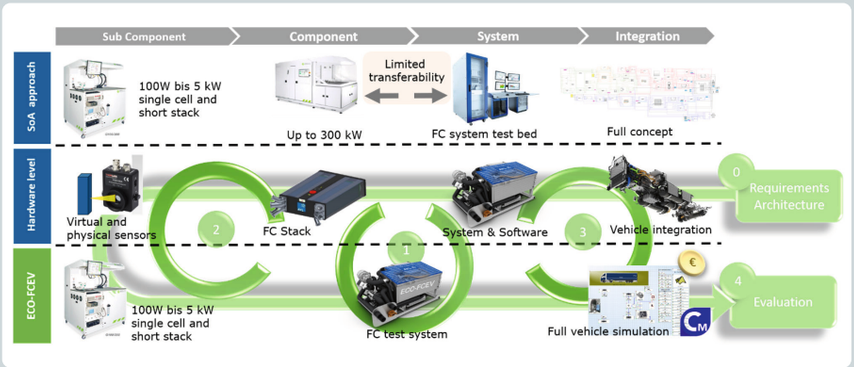
✓ **Energy efficiency**

✓ **Cost reduction**

✓ **Durability**

Significant progress for FC vehicles can be expected here, not least through an improved understanding of degradation mechanisms and the correct dimensioning/sizing of components and systems as well as the reduction of system complexity, which will then provide the basis for improved energy management and operating strategies, "rightsizing" at the overall system level, and a more durable FC vehicle.

To this end, from Feb-2023 to Jan-2026, ECO-FCEV will particularly research and develop advanced sensors and components, improved water management for optimum humidification, an open multi-functional modular test system (to efficiently transfer results from lab/test system to vehicle), "right-sizing" strategies for FC components and systems for technical and economic optimization, to eventually improve energy management and operating strategies on FC powertrain and vehicle level, demonstrated via whole vehicle system simulation.



The ECP-FCEV approach

Project Goals

The Overall Project Goal of ECO-FCEV

Improve the marketability of FCEVs (passenger cars and light duty vehicles), including their ecological and economic sustainability, by **reducing degradation and avoiding oversizing** (via "rightsizing" of components and subsystems), thereby **increasing the energy efficiency** as well as **durability of FC powertrains**, and **reducing costs** at system and vehicle level (during development, purchase, and use).

Specific Goals of ECO-FCEV

G1 Increase the energy efficiency of the vehicle FC powertrain by at least 10-15% (0,7 kg H_2 consumption / 100 km) compared to current passenger car market leaders by reducing degradation in the FC stack, more efficient energy management and improved operating strategies

G2 Reduce the production costs of the FC system / powertrain / vehicle by 9-10% / 4-5% / 2-3% respectively (< 40€/kW FCS cost), by "rightsizing" of components, optimization of safety concepts and reducing the number of components

G3 Reduce the development time and cost for FC powertrains by 25% and 10-15% respectively

G4 Develop an open multi-functional modular test system for fast component and operating strategy validation

G5 Demonstrate the proof of concept of the developed ECO-FCEV solutions incl. advanced components, improved/better parametrized models (degradation, rightsizing), improved operating strategies and transferability to different vehicle classes