

Paul Haering (Lead author), Jose M. G. Campos, Consuelo M. González, Markus Kogler, Ali Molavi, Juan S. Monreal, Emelie Nordqvist, Georg Oberholzer, Demetrius Ramette, Gema M. Ríos, Alexander Schenk

INN-BALANCE Guidebook

Improvement of Balance of Plant Components for PEM based automotive fuel cell systems







FUEL CELLS AND HYDROGEN JOINT UNDERTAKING

Lead author

Paul Haering (Steinbeis Europa Zentrum, Germany)

Contributors

Jose Manual Garcia Campos (Fundación Ayesa, Spain) Consuelo Mora González (Fundación Ayesa, Spain) Markus Kogler (AVL List GmbH, Austria) Ali Molavi (Universitat Politecnica de Catalunya (UPC), Spain) Juan Sanchez Monreal (Deutsches Zentrum für Luft- und Raumfahrt e. V., Germany) Emelie Nordqvist (China Euro Vehicle Technology AB, Sweden) Georg Oberholzer (Celeroton AG, Switzerland) Demetrius Ramette (Steinbeis Europa Zentrum, Germany) Gema Montaner Ríos (Deutsches Zentrum für Luft- und Raumfahrt e. V., Germany) Alexander Schenk (AVL List GmbH, Austria)





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Paul Haering (Lead author), Jose Manual Garcia Campos, Consuelo Mora González, Markus Kogler, Ali Molavi, Juan Sanchez Monreal, Emelie Nordqvist, Georg Oberholzer, Demetrius Ramette, Gema Montaner Ríos, Alexander Schenk INN-BALANCE Guidebook. Improvement of Balance of Plant Components for PEM based automotive fuel cell systems

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List of Abbreviations

BoP	Balance of plant
CAD	Computer-aided design
CFD	Computational fluid dynamics
DC	Direct current
FC	Fuel cell
FCEV	Fuel cell electric vehicle
FCH JU	Fuel cells and hydrogen joint undertaking
GHG	Greenhouse gases
H2	Hydrogen
HIL	Hardware in the loop
HW	Hardware
ICE	Internal combustion engine
NVH	Noise, Vibration, Harshness
PEM	Proton-exchange membrane
RPEMS	Rapid prototyping engine management system
SW	Software
THDA	Total harmonic distortion analysis
TRL	Technology readiness level
WLTC	Worldwide harmonized light vehicles test cycles

Abstract

INN-BALANCE in a nutshell

Fuel cells are a mature technology ready for scale-up in the automotive market. It is now about advancing manufacturing through reducing costs of production, while increasing the overall efficiency and reliability of fuel cell systems in cars. These are the goals of INN-BALANCE.

The EU funded research and innovation project focuses on the Balance of Plant components, developing new features for the supply of hydrogen and air to the stack and improved concepts for the thermal management and advanced control architecture of the fuel cell system.

Project duration: 01/2017–10/2021 Participant countries: Austria, Germany, Spain, Sweden and Switzerland

INN-BALANCE guidebook

The present guidebook presents the main project activities and the main results generated by the nine partners of INN-BALANCE. It also contains an overview of the current market for hydrogen vehicles in Europe and provides an outlook to future challenges in this field. The main target groups of this document are vehicles OEMs and their suppliers, fuel cell integrators and manufacturers, BoP manufacturers, research institutions, public authorities such as municipalities and policy makers and other stakeholders from the fuel cell, automotive, energy and transport sectors such as utilities, clusters / networks.

Fuel cells are a mature technology ready for scale-up in the automotive market. It is now about driving manufacturing forward by reducing production costs, while increasing the overall efficiency and reliability of fuel cell components and systems.

INN-BALANCE is an EU project funded by the Fuel Cells and Hydrogen 2 Joint Undertaking tackling this question. INN-BALANCE focuses on the improvement of Balance of Plant (BoP) components for automotive fuel cell systems through design optimisation, testing of innovative components and modules, and the assembly and testing of the complete fuel cell system under laboratory and automotive conditions. Nine partners from five countries are involved in the project.

Balance of Plant components include compressors, pumps, sensors, heat exchangers, humidifiers, recirculation blowers, etc. In INN-BALANCE, four different modules, each consisting of several BoP components were studied and optimised: the cathode module and the anode module supplying respectively air and hydrogen to the fuel cell stack, the thermal management system keeping all components at a desired temperature and the control system ensuring smooth operation.

This guidebook presents the main project activities and results generated during the project. It also contains an overview of the current market for hydrogen vehicles in Europe and provides an outlook to future challenges in this field. The main target groups of this document are vehicles OEMs and their suppliers, fuel cell integrators and manufacturers, BoP manufacturers, research institutions, and public authorities.







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