DOCDE: DC/DC COverter-based Diagnostics for PEM systems

Type of project: Funded by the Fuel Cells and Hydrogen Joint Technology Initiative of the FP7 energy program of the European Commission. Grant Agreement Number 256673.
February 2011-February 2014

Coordination:

Coordinator: Prof. Cesare Pianese, Dept. of Industrial Engineering, University of Salerno (Italy)
pianese@unisa.it

Local contact: Prof. Marie-Cécile Péra, Dept. of Energy, FEMTO-ST Institute, University of Franche-Comté, France
FCLAB Research federation, FR CNRS 3539
marie-cecile.pera@univ-fcomte.fr

Partners :

UNISA	Universita Degli Studi Di Salerno, Italy
EIFER	European institute for energy research, Germany
UFC	University of Franche-Comté, France
FCLAB	Fuel cell lab, CNRS Research Federation, France
DANTHERM	Dantherm Power A.S, Danmark
CIRTEM	Cirtem, France
BITRON	Bitron SPA, Italy
INNO	Inno TSD SA, France

Abstract:

The D-CODE project aims at developing and implementing on-line electrochemical impedance spectroscopy (EIS) to have direct and meaningful information on the system status. EIS has been proven to be an effective diagnostic tool for laboratory tests. It will be implemented on-board thanks to a new DC/DC converter conceived by the D-CODE's partners. The new hardware will be developed together with dedicated power electronics functions that will enable the measurement of the impedance spectrum. Dedicated on-line diagnosis algorithms will be implemented according to different approaches to effectively monitor faults or degradation mechanisms.

Two stationary PEM fuel cell applications will be considered, namely low temperature power backup and high temperature CHP, these two configurations cover all the potential stationary use of PEM fuel cell systems. Extensive testing will be performed to validate the diagnostic strategies and evaluate their effectiveness in improving control actions aimed at optimizing operating conditions and increasing lifetime. The D-CODE diagnostic concept relies on the combination of power electronics hardware and diagnostic algorithms, whose functions can be easily extended to other applications of PEM fuel cell systems and, in perspective, to all FC technologies as well.

The D-CODE project's outcomes are expected to improve management and operational capabilities of both low and high temperature PEM fuel cells, to enhance monitoring capabilities, increase maintenance time with higher MTBF and reduce degradation rate. These achievements are crucial and will foster the deployment of PEM fuel cells for on field use. The D-CODE project gathers together a group of research institutions and industries whose skills guarantee the required knowledge to convey the project from the EIS concept to its on-field implementation.