



Simulation, Statistics and Experiments Coupled to develop Optimized and Durable μ CHP systems using Accelerated Tests

Objectives

The main objective of Second Act is to improve understanding of stack degradation and propose durability improvements for μ CHP systems using PEMFC or DMFC. The aims are:

- Analysing **long term lifetime tests data from existing systems**.
- Conducting **lifetime tests to investigate degradation** at cell and stack levels.
- Developing, applying and validating **accelerated stress tests (AST)**.
- **In-situ** and **ex-situ** investigation of the degradation mechanisms.
- Developing new **statistical approach and models** for better understanding and description of degradation.
- **Demonstrating stack lifetime improvements** increased tolerance to applications' relevant cycling or operating modes for **pure H₂, Reformate PEMFC and DMFC**.

Strategy

The activity of Second Act is focused on three major aspects, in order to improve considerably the understanding on degradation of **H₂ PEFC, reformate PEFC, and DMFC** and to propose effective stack improvements:

- The active layers: the components most critically affected by degradation
- Heterogeneity in MEA (Membrane Electrode Assembly) operation that has a crucial role in determining the overall performance degradation
- Failure and critical events: a considerable fraction of failures has stochastic nature/characteristics, caused by defects in components or critical events, often associated to balance of plant (BoP) malfunctioning.

The lifetime improvements expected at system level are addressed here through modifications of the core components of the system, the **MEA**.

Work Plan

Second Act is divided into 4 technical Work Packages (WP1/2/3/4), WP5 about dissemination and exploitation and WP6 about Management. The three fuel cell technologies, **H₂ PEFC, reformate PEFC, and DMFC**, are jointly studied in all the WP.

At a Glance

Project Title: Simulation, Statistics and Experiments Coupled to develop Optimized and Durable μ CHP systems using Accelerated Tests

Consortium:

1. Commissariat à l'Énergie Atomique et aux Énergies Alternatives – LITEN (CEA), France
2. IRD FUEL CELLS A/S (IRD), Denmark
3. NEDSTACK FUEL CELL TECHNOLOGY BV NEDSTACK), The Netherlands
4. ICI CALDAIE Spa (ICI), Italy
5. Politecnico Di Milano (POLIMI), Italy
6. Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR), Germany
7. European Commission, Directorate General Joint Research Centre (JRC), Belgium
8. STIFTELSEN SINTEF (SINTEF), Norway
9. Graz University of Technology (TUG), Austria

Call Topic: AIP SP1-JTI-FCH.2013.3.1 - Improving understanding of cell & stack degradation mechanisms using advanced testing techniques, and developments to achieve cost reduction and lifetime enhancements for Stationary Fuel Cell power and CHP systems

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