

FCH-JU projects DIAMOND & HEALTH-CODE organise

Monitoring, Diagnostics & Control for Fuel Cells

One-Day
Workshop

KKL, Lucerne, Switzerland
July 4, 2017, 9.00-18.00

This workshop will focus on the implementation and use of the technology beyond the project duration. Its objective is to exploit the technology in commercial means after the project ends. The workshop will summarize the progress towards the exploitation by industrial partners and potential customers. In addition, mid-term results achieved by HEALTH-CODE will be shown and discussed as well. The work of more than 30 scientists and engineers from 14 teams will be presented aiming at drafting a coherent scenario for the effective development of monitoring, control and diagnostics methodologies able to improve performance and durability of fuel cells.

Free - Registration required

www.EFCF.com/MDC

MDC@EFCF.com

Supported by

6th European PEFC & ELECTROLYSER Forum





www.diamond-sofc-project.eu



www.fch-ju.eu



www.pemfc.health-code.eu

One Day Workshop on Monitoring, Diagnostics and Control for Fuel Cells

Improving fuel cells performance through innovative diagnosis and control

4 July 2017 – Lucerne (CH)

KKL - European Fuel Cell Forum 2017

venue: www.efcf.com/SE

registration: www.efcf.com/MDCreg

info: MDC@efcf.com

The workshop presents the current status and the most recent advancements concerning research on monitoring, diagnostics and control of both PEMFC and SOFC systems. It is jointly organized by the projects DIAMOND* and HEALTH-CODE.

DIAMOND aims at a substantial improvement of the current performance of SOFC systems for CHP applications to boost their market deployment. Advanced monitoring tools are developed to integrate diagnostic and control functions with the objective of having meaningful information on the current state-of-the-health of the entire system.

HEALTH-CODE focuses on developing advanced monitoring and diagnostic tool for μ -CHP and backup PEM fuel cell systems equipped with air and O₂-fed stacks, respectively. Such a tool is based on the measurement of the electrochemical impedance spectroscopy (EIS) while the stack is running in real configurations. Particularly, EIS allows the identification of FC current status to support the detection of five stack failure modes, as well as inferring on its remaining useful life.

Both projects implement a holistic view over stack and system, enabling advanced management and providing a comprehensive solution to the problem of achieving improved performance and maintenance scheduling, higher reliability and, thus, increased lifetime of PEMFC and SOFC.

The workshop gathers engineers and researchers from industry, academia and research institutions interested in the most recent advancements on monitoring, diagnostics and control tools. A comprehensive overview and the exploitation potential of the projects results are offered to the interested stakeholders and users at various academia, industry and research levels. Emphasis is given to methodological approaches for monitoring and diagnostics that can help achieving reliable performance of both stacks and BoP components. Control techniques, along with their applications for SOFC performance optimization, are also presented.

The workshop will start with an overview of the projects; then, main results will be reported on the experimental activity and on various approaches for monitoring, diagnostics and advanced control. The work of more than 40 scientists and engineers from 14 teams will be presented aiming at drafting a coherent scenario for the effective development of monitoring, control and diagnostic methodologies to improve performance and durability of fuel cells. Guests from industry will bring their knowledge, expertise and perspectives. At the end, an open discussion among the attendants will be set to share experience and draft future paths towards FC improvements via advanced diagnostics and control.

Registration is free of charge; coffee, beverages and lunch will be offered to all guests.

* The project DIAMOND (Diagnosis-aided control for SOFC power systems) has received funding from the EU Seventh Framework Programme (FP7/2007-2013) for the Fuel Cells and Hydrogen Joint Technology Initiative under grant agreement n° 621208.

The project HEALTH-CODE (Real operation pem fuel cells HEALTH-state monitoring and diagnosis based on dc-dc Converter embedded EIS) has received funding from the Fuel Cells and Hydrogen 2 Joint Undertaking under grant agreement No 671486. This Joint Undertaking receives support from the EU Horizon 2020 research & innovation programme.



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PROGRAM

9.00 – 9.10	Welcome	
9.10 – 9.30	Diagnostics and Control for FC – motivations, challenges and main issues	C. Pianese, UNISA
9.30 – 9.50	Description of project DIAMOND	R. Makkus, HYG
9.50 – 10.10	Description of project HEALTH-CODE	C. Pianese, UNISA
10.10 – 10.30	EIS Characterization of O ₂ -fed PEMFC under fault operations	M.C. Péra, UFC
10.30 – 10.50	Influence of operating and faulty conditions on the EIS spectra of PEMFC-based μ -CHP systems	S. Araya, AAU; P. Moçotéguy, EIFER
10.50 – 11.10	Scaling-up technique for PEMFC EIS, from single cell to stack	P. Polverino, UNISA
11.10 – 11.30	Operation results for DIAMOND advanced configuration, Standard control versus Advanced control	R. Makkus, HYG
11.30 – 11.50	Testing and validation of advanced control and diagnostics for SOFC - not quite business as usual	A. Pohjoranta, VTT
11.50 – 12.10	Model-based design of diagnostic tools for conventional and advanced SOFC systems	D. Marra, UNISA
12.10 – 12.30	Total Cost of Ownership reduction of fuel cell systems thanks to diagnosis and prognosis algorithms	S. Faivre, H2SYS
12.30 – 14.00	Lunch break	
14.00 – 14.20	Health-based control and optimisation of SOFC stack operation	Đ. Juričić, IJS
14.20 – 14.40	State-of-health estimation and prognosis of the remaining useful life in SOFC systems	B. Dolenc, IJS
14.40 – 15.00	EIS and soft computing techniques for the diagnosis of O ₂ -feed PEMFC	M.C. Péra, UFC
15.00 – 15.20	Equivalent Circuit Model-based diagnosis of PEMFC via EIS	P. Polverino, UNISA
15.20 – 16.00	Hardware/software design for on-board fuel cell EIS	G. Petrone, W. Zamboni, UNISA; E. Bianconi, BIT
16.00 – 16.20	Advanced control, diagnostics and monitoring for SOFC, the industry perspective	Industry representative TBC
16.20 – 16.40	Discussion among guests, partners, participants	

Affiliation: AAU, Aalborg University (DK); BIT, Bitron Industrie S.p.A. (I); EIFER, European Institute for Energy Research (D); H2SYS, Hydrogen to System (F); HYG, Hygear (NL); IJS, Jožef Stefan Institute (SI); UFC, University of Franche-Comté (F); UNISA, University of Salerno (I); VTT, technical Research Centre of Finland (FI).

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Symposium on

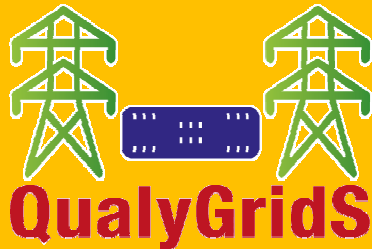
European Grid Service Markets

Grid Flexibility & Business

with new Technologies such as Electrolysers
Control reserves, direct marketing, dynamic load
management, virtual power plant, ...

July 6, 2017

9.00-18.00 KKL
Lucerne, Switzerland



The way in which the **electrical energy market** is organized in Europe is changing, opening opportunities for more flexibility in generation and consumption. **New sustainable technologies** for storage and conversion of energy such as water electrolysers, fuel cells, batteries, thermal and compressed air storage systems meet the needs of the **future transmission and distribution grid**.

Registration*

www.EFCF.com/GSM; GSM@EFCF.com

* 50.- CHF for EFCF participants

Symposium only: 350.- CHF incl. refreshments, business lunch, documents, access to exhibition & poster area

Organised by QualyGridS &

6th European PEFC & ELECTROLYSER Forum



Announcement

European Grid Service Markets

Symposium



6th July 2017

KKL, Lucerne Switzerland

**Grid Flexibility & Business
with new Technologies**

**Control reserves
Direct marketing**

Dynamic load management

Virtual power plant

The way how the **electrical energy market** is organized in Europe is changing, opening opportunities for more flexibility in generation and consumption. **New sustainable technologies** such as water electrolysers, fuel cells, batteries and others meet the needs of the **future transmission and distribution grid**. Flexibility, virtual power plant, dynamic load management, direct marketing, control reserves, grid services are few of the key words addressing this challenge.

08.30	Registration	Prof. Dr. Christoph Imboden, Head Research Group Power Economy, Lucerne University of Applied Sciences HSLU, CH
09.00	Welcome & Introduction	Dr. Regine Reißner, Project coordinator QualyGridS, DLR

Regulations & Markets

09.15	A journey towards pan-European ancillary services	Dr. Bastian Schwark Head of TSO Markets, Swissgrid
10.00	Impact of renewable energies on the balancing market in Belgium	Bob Hebb Head of Ancillary Services, Elia
10.30	Networking Coffee Break	
11.00	Demand side response in the GB market	Thomas Maidonis Storage & Flexibility Expert, National Grid
11.30	Opportunities of water electrolyzers in the European flexibility markets. A report from the FCH ELYntegration research project	Lara Lück Research engineer, RWTH Aachen, DE
12.00	The role of demand side management in the Scandinavian and Baltic countries	Thomas Elgaard Jensen, Dir. Strategic Business Development, Energi Danmark
12.30	Business Lunch on the Terrace of KKL, Coffee in the exhibition & in front of the Club Rooms	

Experience with Business Model

14.00	Chances with Wind in the Grid: How to meet the needs	Giles Dickson CEO at WindEurope asbl/vzw, Brussels BE
14.30	The commercialization of demand side flexibility: A customer journey	Thomas Kudela, Regulatory Manager, Sen. Commercial Developer, DONG Energy, DK
15.00	Application of a Li-ion battery in the frequency containment reserve market	Dr. Marina González Vayá Smart Grid Specialist, EKZ, CH
15.30	Networking Coffee Break	
16.00	Explicit Demand Response in Europe	Jayson Dong, Policy Officer, Smart Energy Demand Coalition Brussels BE
16.30	Economic operation of a water electrolyser - a field report	Dr. Hans Kaspar Scherrer CEO, IBAarau AG
17.00	Summary	Prof. Dr. Christoph Imboden
17.15	Grid-Apéro & FCH JU project exchange meeting	
19.30	Networking Dinner on the Lake (optional, together with EFCF) Boarding 19.20, lake side of KKL pier 5/6 – back 23.15; 22.30 short stop in Brunnen for early return by train	

Registration regularly until 17 June 2017*

On-line: www.EFCF.com/GSMreg

Family Name, First Name:

Institution:

Email:@..... E-mail to: GSM@efcf.com or Fax: +41 43 508 0622

Select: Day Programme	<input type="checkbox"/>	CHF 350.-	<small>CHF 50.- for EFCF 2017 participants; *After 17 June 2017 for all plus CHF 50.- late fee includes refreshments, business lunch, documents, access to exhibition & poster area</small>	}	Total CHF
Dinner on the Lake	<input type="checkbox"/>	Number of tickets at CHF 120.-			



Lucerne University of Applied Sciences and Arts

**HOCHSCHULE
LUZERN**



Similarities & Differences

Fuel Cells - Redox Flow Batteries

Keynotes & Expert Discussions in
Special Session

KKL, Lucerne, Switzerland
July 7, 2017, 10.00-16.00

As electrochemical reactors, Redox Flow Batteries (RFB) display certain similarities with low temperature Polymer Electrolyte Fuel Cells (PEFCs), but also differences. The aim of this special session is to outline these similarities and differences. Leading stakeholders will present their most recent progress in RFB-technologies and its scientific aspects. Participants will profit from this high-level exchange and can contribute their experiences in the field and propose expectations for future common R&D in intensive discussions.

Registration*

www.EFCF.com/RFB; RFB@EFCF.com

* Free for EFCF participants

Special Session only: 250.- CHF incl. refreshments, business lunch, documents, access to exhibition & poster area;



Programme/Speakers - July 7, 2017

Similarities & Differences: FC - Redox Flow Batteries I+II

Chaired by:

Günther G. Scherer (ex PSI)
Olaf Conrad & Jochen Friedl

11.00	PEM Fuel Cells and Redox Flow Batteries Differences, similarities and common problems	Rüdiger Schweiss	SGL Carbon GmbH, Meitingen/Germany
11.30	Methods to limit shunt currents in the Vanadium-Redox-Flow-Batteries (VRFB)	Adam H. Whitehead	GILDEMEISTER energy storage GmbH, Wiener Neudorf/Austria
12.00	Catalytic Properties of Carbon in the All-Vanadium-Redox Flow Batteries (aVRFB)	Jochen Friedl, Ulrich Stimming	School of Chemistry, Newcastle Uni., Newcastle upon Tyne/UK
13.30	All-Polymer Redox Flow Batteries (aPRFB)	Olaf Conrad	JenaBatteries GmbH, Jena/Germany
14.00	Progress in miniaturized Redox Flow Batteries	Patrick Ruch (1), Neil Ebejer (1), Julian Marschewski (2), Lorenz Brenner (2), Kleber Marques Lisboa (2), Dimos Poulikakos (2), Bruno Michel (1)	(1) IBM Research - Zurich, (2) ETH Zürich, Zuerich/Switzerland
14.30	Electrolytes for bromine/bromide cathode in hydrogen-bromine Redox Flow Battery (RFB)	Michael Küttinger, Paulette Loichet, Emeline Meyer, Peter Fischer, Karsten Pinkwart, Jens Tübke	Applied Electrochemistry, Fraunhofer Institute for Chemical Technology, Pfingztal/Germany
14.45	Local characterization and 3D simulation of mass transport issues in Vanadium Redox Flow Batteries	Matteo Zago, Mirko Messaggi, Claudio Rabissi, Andrea Baricci, Riccardo Mereu, Fabio Inzoli, Andrea Casalegno	Politecnico di Milano, Dep. of Energy, Milan/Italy
15.00	Design and up scaling of a AQDS-bromine based Redox Cell	Luigi Crema (1, 2), Simone Amicabile (1), Matteo Testi (1)	(1) Fondazione Bruno Kessler, (2) Green Energy storage, Trento/Italy
15.40	New materials, methods & concepts for Hydrogen Fuel Cells	Hubert Gasteiger	Technical Electrochemistry, Technical University of Munich, Garching/Germany

Summary & Discussion on future common Exchange-Activities FC-RFB

www.EFCF.com/RFB

