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## H<sub>2</sub>FC

*Integrating European Infrastructure to support science and development of Hydrogen- and Fuel Cell Technologies towards European Strategy for Sustainable, Competitive and Secure Energy*

# Deliverable

### D5.1 Schedule and report on Project Promotion and Dissemination

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## Table of Contents

<b>1</b>	<b>H<sub>2</sub>FC TOPIC.....</b>	<b>4</b>
1.1	INTRODUCTION .....	4
1.2	DISSEMINATION ACTIVITIES.....	9

# 1 H<sub>2</sub>FC Topic

## 1.1 Introduction

At the site of the European Commission it is available a summary of the H<sub>2</sub>FC project: Integrating European Infrastructure to support science and development of Hydrogen – and Fuel Cell ([http://ec.europa.eu/research/infrastructures/pdf/h2fc\\_dec12](http://ec.europa.eu/research/infrastructures/pdf/h2fc_dec12)).

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## H<sub>2</sub>FC

Integrating European infrastructure to support science and development of Hydrogen- and Fuel Cell technologies

Efficient technologies combining hydrogen and fuel cells will play a key role in Europe's move towards a more sustainable energy mix. They will widen the scope to store excess energy where power generation does not coincide with immediate demand, boosting the potential of systems based on renewable energy sources — such as wind farms, photovoltaic installations and hydroelectric power plants. H<sub>2</sub>FC was designed as a catalyst for coordinated research and development in this area. It provides a framework where outstanding expertise and installations are shared and enhanced.

### A powerful process

In the H<sub>2</sub>FC project, the combined knowledge, expertise and technical assets of 19 partners from the EU, Norway and Switzerland are focused on greater research coordination as a means of perfecting hydrogen and fuel cell technology. It encourages scientists and researchers to advance their ideas through experimental work and collects knowledge about specific scientific bottlenecks. This initiative, unprecedented in Europe, involves leading R&D organisations representing both the hydrogen and the fuel cell communities. Its scope encompasses the entire process, from hydrogen production and storage to distribution and use in fuel cells.

The project aims to complement the action of the Fuel Cell and Hydrogen Storage Joint Undertaking (FHC JU). It builds on the outcomes of earlier endeavours which include the European Network of Excellence for Hydrogen Safety (HySafe) as well as FCTestNet and FCTesQA — respectively, the EU-funded projects 'Fuel cell testing and standardisation thematic network' and 'Fuel cell testing, safety, quality assurance'.

As part of their remit, the partners are conducting extensive networking activities in order to create and disseminate knowledge, refine the operation of the provided facilities and coordination in matters of safety, performance and durability, and create centralised databases and libraries for safety, performance and durability data and modelling codes.

### Electrifying opportunities

The partners are equally committed to facilitating the access to their own R&D installations, providing opportunities to use equipment that is rare, usually expensive, and in some cases unique in Europe. Eligible facilities encompass high-stability fuel cell test rigs suitable for long-term durability testing and trials of components and devices, neutron beam and synchrotron facilities for the characterisation of materials, and nanotechnology capacity for work on hydrogen storage materials and electrodes. They also include facilities where the safety issues can be addressed for the full range of applications, from small hydrogen-fuelled devices to large tank systems. The high cost of acquiring and running such equipment often limits the scope to take new concepts forward, as do scientific bottlenecks and gaps — notably for teams from academia and SMEs, which are a particularly prolific source of innovative ideas.

In addition to encouraging physical access to their research facilities, the H<sub>2</sub>FC partners support the wider scientific community through a CyberLab, a virtual resource where first-hand information and data will be provided to support modelling and simulation. As one of its more prominent functionalities, this e-platform facilitates pre-test simulations in view of cost-effective, time-efficient experimentation.



components and systems of the hydrogen chain and fuel cell technology. Further effort will be devoted to protocols, methods and benchmarking.



Hydrogen dispenser for vehicles © Shutterstock, 2012, Mona Makela



**Project acronym:** H<sub>2</sub>FC

**Funding scheme (FP7):** Integrating Activities (IA)

**EU financial contribution:** €8 million

**EU project officer:** Mariano Menna

**Duration:** 48 months

**Start date:** 1 November 2011

**Completion date:** 31 October 2015

**Partners:**

Karlsruher Institut für Technologie (DE)

Commissariat à l'Énergie Atomique et aux Énergies Alternatives (FR)

University of Ulster (GB)

Institutt for Energiteknikk (NO)

Health and Safety Executive (GB)

Joint Research Centre (EC)

Forschungszentrum Jülich (DE)

Paul Scherrer Institut (CH)

National Center for Scientific Research 'Demokritos' (GR)

Università degli Studi di Perugia (IT)

Agenzia Nazionale per le Nuove Tecnologie, l'Energie e lo Sviluppo

Economico Sostenibile (IT)

Bundesanstalt für Materialforschung und -prüfung (DE)

Fundación Tecnalia Research & Innovation (ES)

Università di Pisa (IT)

Pro-Science — Gesellschaft für Wissenschaftliche und Technische

Dienstleistungen (DE)

National Physical Laboratory (NPL) Management Limited (GB)

Stiftelsen SINTEF (NO)

Teknologian Tutkimuskeskus VTT (FI)

Eidgenössische Materialprüfungs- und Forschungsanstalt (CH)

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**Project webpage:** <http://www.h2fc.eu>

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Another important dissemination activity was the press release published by the BNN- Badische Neueste Nachrichten Newsletter in Germany on 13<sup>th</sup> March 2012 telling about the work that is carrying out from 19 partners which scope includes from hydrogen production and storage, the simulation and modeling of failed mechanism as well as test installations for fuel cells.



Dienstag, 13. März 2012

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## Wasserstoff wirft viele Fragen auf

**Karlsruhe (em).** Im Projekt „H<sub>2</sub>FC“ bündeln 19 Partner ihr Wissen über Wasserstoff und wasserstoffbetriebene Brennstoffzellen. „Bei diesen Technologien gibt es noch viele Detailfragen zu klären, das reicht vom grundsätzlichen Verhalten von Wasserstoff unter extremen Bedingungen über die Wasserstoffherstellung bis zur Entwicklung von Speicher-materialien und Tanksystemen“, fasst Koordinator Olaf Jedicke vom KIT zusammen.

Die KIT-Forscher arbeiten dabei vor allem an Wasserstoffspeicher-materialien, an der Simulation und Modellierung von Versagensmechanismen sowie an Testständen für Brennstoffzellen und Anlagen zur Bereitstellung von Wasserstoff.

A remarkable dissemination activity is planned as the 5th International Conference on Hydrogen Safety (ICHS 2013) that will be held in Brussels, Belgium on September 9-11, 2013 under the auspices of the International Association for Hydrogen Safety (IA HySafe). The conference will be hosted by the Joint Research Centre (Institute for Energy and Transport) of the European Commission and it will improve the public awareness and trust in hydrogen technologies by communicating a better understanding of both the hazards and risks associated with hydrogen and their management. The first four conferences in 2005, 2007, 2009 and 2011 succeeded in attracting the most relevant experts from all over the world, by providing an open platform for the presentation and discussion of new findings, information and data on hydrogen safety—from basic research to applied development and to standardization and regulatory issues.

As we are approaching the beginning of the commercialization phase of hydrogen fuel cell vehicles in 2015, ICHS2013 will focus on progress in safety of hydrogen technologies and infrastructure, as crucial/essential means to enable the transition to a zero carbon energy system. Therefore, the conference seeks papers in a wide range of hydrogen safety topics like (but not limited to) Regulations Codes and Standards, safety in H<sub>2</sub> infrastructure, safety solutions for the implementation of H<sub>2</sub> technologies, hydrogen and hydrogen blends behaviour, physical effects, consequence analysis, incidents, accidents and near misses, hydrogen effects on materials and components, safety of energy storage, risk management, fuel cells related safety issues.

### Organizing Institutions:



### With the endorsement of:



Italian National  
Fire Corps



### In collaboration with:



**H<sub>2</sub>FC European Infrastructure Project**



**ISO/TC 197 HYDROGEN TECHNOLOGIES**





## 1.2 Dissemination activities

The table below presents the list of 36 Conferences and Workshops, and 7 Publications on Journals, with respective titles, dates and places as dissemination activities from different partners .

N°	Type of activities	Main leader	Title	Date	Place	Type of presentation	Countries addressed
1	Conference	UP	Modeling and analysis of SOFC BoP thermal transients for diagnostic scopes	11-13th December 2013	Rome (Italy)	Oral	International audience
2	Conference	UP	Synthesis and test of innovative sorbents based on calcium aluminates for SE-SR	11-13th December 2013	Rome (Italy)	Oral	International audience
3	Presentation	UP	H2FC: plenty of opportunities for you!	27th September 2013	Terni (Italy)	Oral	International audience
4	Presentation	UP	H2FC: plenty of opportunities for you!	6th May 2013	Vimar (Italy)	Oral	International audience
5	Presentation	UP	H2FC: plenty of opportunities for you!	24th April 2013	Dresden (Germany)	Oral	International audience
6	Publication	EE	Etude du comportement mécanique d'un hydrure intermétallique utilisé pour le stockage d'hydrogène	1st April 2013	Université de Grenoble	Oral	International open access
7	Workshops	EMPA	Self-Igniting Catalytic Hydrogen Burner with Zero Emission	21-25th January 2013	Stoos (Swiss)	Poster	International audience
8	Conference	KIT	H2FC European Infrastructure Project, Science and Development alongside the Technological Hydrogen Chain	21-25th January 2013	Stoos (Swiss)	Oral	International audience

N°	Type of activities	Main leader	Title	Date	Place	Type of presentation	Countries addressed
9	Conference	EMPA	Sorption Enhanced Reactions for Renewable Synfuels	21-25th January 2013	Stoos (Swiss)	Oral	International audience
10	Conference	EMPA	The Energy Density of Hydrogen Storage Systems	21-25th January 2013	Stoos (Swiss)	Poster	International audience
11	Presentation	UP	H2FC: plenty of opportunities for you!	9th January 2013	Marostica (Italy)	Oral	International audience
12	Conference	KIT	H2FC European Infrastructure Project, Science and Development alongside the Technological Hydrogen Chain	28-29th November 2012	Brussels (Belgium)	Oral	International audience
13	Workshops	NCSR D	Hydrogen as an energy carrier: Challenges and Prospects	25th October 2012	Nicosia (Cyprus)	Oral	International audience
14	Workshop	SINTEF	Membrane and Fuel Cell testing at low to high temperatures	24-28th September 2012	Arina Sands Hotel, Heraklion, Crete (Greece)	Oral	International audience
15	Workshop	UPI	Instrumentation and research methods at University of Pisa Hydrogen and Hydrogen-Methane mixture concentration and gas chromatography	24-28th September 2012	Arina Sands Hotel, Heraklion, Crete (Greece)	Oral	International audience
16	Workshop	NCSR D	Ground breaking research at NCSR D: LES modeling of hydrogen dispersion and combustion using the ADREA-HF Code	24-28th September 2012	Arina Sands Hotel, Heraklion, Crete (Greece)	Oral	International audience
17	Workshop	NCSR D	Simulations for thermal design of hydrogen storage systems	24-28th September 2012	Arina Sands Hotel, Heraklion, Crete (Greece)	Oral	International audience

N°	Type of activities	Main leader	Title	Date	Place	Type of presentation	Countries addressed
18	Workshop	NCSR	Instrumentation and research methods at NSCRD: Capacity, kinetics, thermodynamics and cycle life measurements of hydrogen storage materials	24-28th September 2012	Arina Sands Hotel, Heraklion, Crete (Greece)	Oral	International audience
19	Presentation	UP	H <sub>2</sub> FC: plenty of opportunities for you!	14th November 2012	Rome (Italy)	Oral	International audience
20	Conference	NCSR	Comparison of different Pd doped carbon foam/carbon nanoparticles composites for hydrogen storage	11-14th September 2012	Hammamet (Tunisie)	Oral	International audience
21	Workshop	UP	Methods and test rig for HT FC performance analysis	24-28th September 2012	Heraklion, Crete (Greece)	Oral	International audience
22	Workshop	UP	Innovative materials testing for Sorption enhanced steam reforming	24-28th September 2012	Heraklion, Crete (Greece)	Oral	International audience
23	Workshop	EMPA	In-situ and in-operando methods for hydrogen related research	24-28th September 2012	Heraklion, Crete (Greece)	Oral	International audience
24	Workshop	UPI	The influence of experimental data on the regulation “Italian Technical Rule for Hydrogen Pipelines”	24-28th September 2012	Heraklion, Crete (Greece)	Oral	International audience
25	Workshop	KIT	H <sub>2</sub> FC European Infrastructure Project Integrating European Infrastructure	24-28th September 2012	Heraklion, Crete (Greece)	Oral	International audience
26	Presentation	UP	H <sub>2</sub> FC: plenty of opportunities for you!	22th September 2012	Perugia (Italy)	Oral	International audience

<b>N°</b>	<b>Type of activities</b>	<b>Main leader</b>	<b>Title</b>	<b>Date</b>	<b>Place</b>	<b>Type of presentation</b>	<b>Countries addressed</b>
27	Conference	KIT	H2FC European Infrastructure alongside the hydrogen chain	3rd-7th Juni 2012	Toronto Centre Sheraton, Toronto	Oral	International audience
28	Presentation	NCSR D	H2FC: plenty of opportunities for you!	15th Juni 2012	Perugia (Italy)	Oral	International audience
29	Conference	NCSR D	Porous carbons as sorbents, substrates and scaffolds for hydrogen storage applications	21-25th April 2012	Heraklion, Crete (Greece)	Oral	International audience
30	Conference	KIT	The H2FC project “Integrating European Infrastructure to support science and development of Hydrogen-and Fuel Cell technologies towards European Strategy for Sustainable, Competitive and Secure Energy	14-16th December 2011	Frascati Research Center (Italy)	Poster	International audience
31	Conference	KIT	The H2FC project “Integrating European Infrastructure to support science and development of Hydrogen-and Fuel Cell technologies towards European Strategy for Sustainable, Competitive and Secure Energy	1st-6th December 2011	Occidental Grand Xcaret (Mexico)	Oral	International audience
32	Conference	UPI	Hydrogen-methane mixtures: dispersion and stratification studies	12-14th September 2011	San Francisco (California USA)	Oral	International audience
33	Conference	KIT	The H2FC project “Integrating European Infrastructure to support science and development of Hydrogen-and Fuel Cell technologies towards European Strategy for Sustainable, Competitive and Secure Energy	12-14th September 2011	San Francisco (California USA)	Oral	International audience
34	Conference	UPI	Experimental study of hydrogen releases in the passenger compartment of a Piaggio	12-14th September	San Francisco (California USA)	Oral	International audience

N°	Type of activities	Main leader	Title	Date	Place	Type of presentation	Countries addressed
		porter van		2011			
35	Conference	UPI	Development of an Italian fire prevention technical rule for hydrogen pipelines	12-14th September 2011	San Francisco (California USA)	Oral	International audience
36	Conference	UPI	Safety distances: comparison of the methodologies for their determination	12-14th September 2011	San Francisco (California USA)	Oral	International audience
		Papers/ Title	Main Author	Title of the periodical	Publisher	Date of publication	Relevant pages
		Investigation of hydride powder bed swelling and shrinking during hydrogen absorption/desorption cycles under different compressive stresses	Benoit Charlas <b>CEA</b>	Journal of Alloys and Compounds	Elsevier BV	15/02/2013	im press/corrected proof/note
		Diagnosis methodology and technique for Solid Oxide Fuel Cells: a review	Linda Barelli <b>UP</b>	International Journal of Hydrogen Energy	Elsevier Limited	12/04/2013	5060-5074
		Zr doped anatase supported reticulated ceramic foams for photocatalytic water purification	G. Plesch <b>EMPA</b>	Materials Research Bulletin	Elsevier Limited	29/03/2012	1680-1686
		Reversible hydrogen absorption in sodium intercalated fullerenes	Ph. Mauron	International Journal of Hydrogen Energy	Elsevier Limited	28/07/2012	14307-14314
		Diborane release and structure distortion in borohydrides	Elsa Callini <b>EMPA</b>	Dalton Transactions	Royal Society of Chemistry	29/09/2012	719-725
		Electrochemical Characterization of Porous Diaphragms in Development for Gas Separation	J. Stojadinovic <b>EMPA</b>	Energy and Environmental Science	Royal Society of Chemistry	23/03/2012	F25-F28
		Surface and bulk reactions in borohydrides and amides	A. Borgschulte <b>EMPA</b>	Energy and Environmental Science	Royal Society of Chemistry	23/03/201	6823-6832