Research Opportunities to Focus on Scientific- and Technical Bottlenecks

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5th INTERNATIONAL CONFERENCE ON HYDROGEN SAFETY
Brussels (Belgium)
The European Strategy Forum on Research Infrastructures (ESFRI) recognizes in its roadmap for Research Infrastructures that “in the near future hydrogen, as an energy carrier derived from various other fuels, and fuel cells as energy transformers, are expected to come into a major role for mobility but also for different other mobile and stationary applications” [1].

[1] ESFRI, European Road Map for Research Infrastructures (Report 2006)
The European Strategy Forum on Research Infrastructures (ESFRI) recognizes in its roadmap for Research Infrastructures that “in the near future hydrogen, as an energy carrier derived from various other fuels, and fuel cells as energy transformers, are expected to come into a major role for mobility but also for different other mobile and stationary applications” [1].

Also no concrete aims were defined at that time, we are far behind to comply this ideal conception!
H2FC European Infrastructure

Transnational Access Activities

TA 1 Transnational Access @ KIT
TA 2 Transnational Access @ CEA
TA 3 Transnational Access @ IFE
TA 4 Transnational Access @ HSE
TA 5 Transnational Access @ JRC
TA 6 Transnational Access @ Jülich
TA 7 Transnational Access @ PSI
TA 8 Transnational Access @ NCSRD
TA 9 Transnational Access @ UP
TA 10 Transnational Access @ BAM
TA 11 Transnational Access @ Tecnalia
TA 12 Transnational Access @ NPL
TA 13 Transnational Access @ SINTEF
TA 14 Transnational Access @ EMPA

Joint Research Activities

JRA 1 JRC
Facility Improvements for Investigation of Basic Hydrogen Properties and Material Behaviour

JRA 2 Jülich
Facility Improvements for Investigations of Components and Systems of the Hydrogen Energy Chain

JRA 3 CEA
Methods Protocols Benchmarking

JRA 4 NCSRD
Cyber Laboratory

Networking Activities

N 1 KIT
Entry Point

N 2 UU
Technical School Researchers Exchange Programme

N 3 SINTEF
Foresight Knowledge Innovation

N 4 UP
Dissemination Public Relations

N 5 KIT
Long Term Perspectives of H2FC

Olaf Jedicke; Karlsruhe Institute of Technology
5th INTERNATIONAL CONFERENCE ON HYDROGEN SAFETY 2013; Brussels BELGIUM
Compilation of scientific and technical bottlenecks based on project partners expertise

Compilation of scientific and technical bottlenecks based on external experts

ROME workshop (16th - 17th October 2013)

Discussion forum (continuously)
Main objectives

European Scientific Community

Pool of information about lacks, bottlenecks and key aspects in hydrogen technologies and fuel cells

European Industry
Compilation of scientific and technical bottlenecks based on project partners expertise

Compilation of scientific and technical bottlenecks based on external experts

ROME workshop (16th - 17th October 2013)

Discussion forum (continuously)
Olaf Jedicke; Karlsruher Institute for Technology (Germany); Institute for Nuclear- and Energietechnologies HYPOTHESIS 10th Anniversary; Edinburgh 11.June to 12.June 2013
Main topics of analysis (scientific bottlenecks)

- Hydrogen production (including purification)
- Hydrogen storage and distribution (materials and systems)
- Hydrogen end-use / systems
- Cross-cutting issues

Sub topics: technology defined as key aspects

- Main materials challenges
- Limiting cost factors
- Limitations in characterization/modelling tools
- Main system challenges
- Main safety issues
- Main market challenges
- Other challenges
Analysis of the scientific bottlenecks for commercialization of H2&FC technologies confirms, that the H2FC European Infrastructure project is positioned on the following key issues:

- Test harmonisation and protocols
- Accelerated tests development
- Mechanisms understanding and modelling thanks to advanced characterisation, including in situ characterisation
- Safety issues
Conclusion (Interim Status)

- Amount of **experimental work** (results) decreases (lacks)

- Amount of **simulation and modelling** increases and became included in most technological topics

- Experimental results are needed for **verification** of modelling and simulation

- **Harmonisation** in general but especially standards
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INVITATION

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FIRST ANNOUNCEMENT
European annual research progress review meeting 2013

HYDROGEN AND FUEL CELL SCIENCE AND ENGINEERING - NATIONAL STATUS

Organized by the FP7 H2FC European Infrastructure project (www.h2fc.eu) and EERA JP FCs & H2 (www.eera-set.eu/index.php?index=31)

Rome | October 16 • 17 | 2013

Olaf Jedicke; Karlsruhe Institute of Technology
5th INTERNATIONAL CONFERENCE ON HYDROGEN SAFETY 2013; Brussels BELGIUM
Who should attend?
Scientists from academia, research organisations, industry, and project managers.

Annual review 2013 sessions
- Hydrogen safety
- Hydrogen production
- Hydrogen storage
- Fuel cells
Each session will be accomplished by round table discussions led by an expert panel.

Event secretariat:
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Florence Lefebvre-Joud, CEA (France)
Pierre Boillat, PSI (Swiss)
Ulrich Schmidtchen, BAM (Germany)
Chiara Barchiesi, UNIPG (Italy)
Many thanks for your attention
H₂FC European Infrastructure Project Basics

H₂FC European Infrastructure Project
Integrating European Infrastructure to support science and development of Hydrogen- and Fuel Cell Technologies towards European Strategy for Sustainable, Competitive and Secure Energy

48 months duration (starting 1st November 2011 – 31 October 2015)
19 European beneficiaries
10.3 Mio € overall project budget
8 Mio € European Commission's contribution to the project
H₂FC European Infrastructure Focus

1. Support research and development concerning fuel cells and hydrogen \textit{(practical part)}
2. Collect the knowledge about scientific and technical bottlenecks regarding fuel cells and hydrogen applications \textit{(theoretical part)}
3. Distribution of information and knowledge \textit{(educational part)}
4. To arrange an additional information platform to share knowledge \textit{(sustaining part)}

\textbf{Needs to get highlighted:} H₂FC European Infrastructure offer research infrastructures to external users, \textit{free of access costs!}
**H₂FC European Infrastructure Project**

1. Support research and development concerning fuel cells and hydrogen *(practical part)*
   
   Results arising from more than 150 – 200 single projects (published)

2. Collect the knowledge about scientific and technical bottlenecks regarding fuel cells and hydrogen applications *(theoretical part)*
   
   To inform and guide EC, FCH-JU, Funding Agencies and Stakeholders about necessities

3. Distribution of information and knowledge *(educational part)*
   
   To share and spread experts knowledge and to educate scientists and engineers

4. To arrange an additional information platform to share knowledge *(sustaining part)*
   
   To inform stakeholders continuously about news at research infrastructures through a Journal concerning research infrastructures (FC-H₂), cyber laboratory
H2FC European Infrastructure Portfolio Offered Infrastructures

- **Performance & Durability**
  - **Solid Storage Materials**
    - HYSORB, SOLTEF
  - **H2 Permeation**
    - GASTEF
  - **Embrittlement, Life time analysis**
    - PretHy, HyCy
  - **Basic Material Investigations**
    - SINQ, IFE Neutron Beam
  - **FC Performance**
    - H2QF, ETC, FCLab
  - **FC Durability**
    - DurSOFC, FCTEST

- **H2 Production**
  - **H2 Sensors**
    - SenTeF, Sens
  - **Flow and Mixing**
    - HySac, HiPres, TunEn, TTS
  - **Ignition and Combustion**
    - HySac, HyKa (PROFLAM), ExCell

- **Hazards, Risks & Safety**
<table>
<thead>
<tr>
<th>Provider</th>
<th>Scientific segment (summary)</th>
<th>Estimated number of projects</th>
</tr>
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<tbody>
<tr>
<td>14</td>
<td>Installation book (downloadable)</td>
<td>180</td>
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<tr>
<td></td>
<td>Installation costs (operating costs within 42 months)</td>
<td>29.750.000€</td>
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**Budget Distribution**

- Joint Research Activities: 2375 T€
- Networking Activities: 2831 T€
- Access Activities: 4520 T€

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