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Summary of the workshop

“Smart Specialisation in the domain of Fuel Cells and Hydrogen technology”

Lyon 22-23/04/2015

1. INTRODUCTION

This workshop was attended by regions interested in Fuel Cells and Hydrogen as part of their Smart Specialisation Strategies. It focused on the role of Fuel Cells and Hydrogen technologies on regional development for both clean transport (cars, buses, captive fleets, etc.) and for sustainable and low carbon energy (stationary power generation, energy storage and grid balancing, etc.). The goal was to initiate practical cooperation between European Regions and to include in this cooperation relevant industry and research partners. This summary is a brief overview of the workshop. Full presentations and FCH JU studies can be found on the internet. <http://www.fch.europa.eu/>.

The Smart Specialisation framework was reviewed by Manuel Palazuelos Martinez, DG JRC, Institute for Prospective Technological Studies (IPTS). It is a strategic approach towards economic development through coordinated and targeted financial support for Research and Innovation (R&I) activities in order to access to the European Structural and Investment Fund (ESIF) interventions (<http://s3platform.jrc.ec.europa.eu>). Special attention is devoted to reinforce synergies between ESIF and other EC funding programmes like Horizon 2020 (of which the FCH JU program is a part).

An overview of the 2014-2020 Investment policy supporting Europe 2020 goals was presented: creating growth and jobs, addressing climate change and energy dependence, and reducing poverty and social exclusion.

- European Regional Development Fund (ERDF)
- European Social Fund (ESF)
- Cohesion Fund (CF)

€ 352 billion of EU funds will be available, covering all EU regions but concentrated on less developed ones, supporting in particular Research and Innovation (R&I), **infrastructure and capacities** to develop R&I excellence, and promoting centres of competence, focused on European interest. This also covers business investment in R&I, **developing links and synergies** between enterprises, research and development centres and the higher education sector, in particular promoting investment in product and service development, technology transfer, social innovation, eco-innovation, public service applications, demand stimulation, networking, clusters and open innovation through smart specialisation, and supporting technological and applied research, pilot lines, early product validation actions, advanced manufacturing capabilities and first production, in particular in key enabling technologies and diffusion of general purpose technologies.

Bert de Colvenaer, FCH JU Executive Director, described the role of the “The Fuel Cells and Hydrogen (FCH) Joint Undertaking”, a Public-Private Partnership (PPP) built under the 7th European Framework Program. From 2008 to 2013, the FCH-JU had a total budget of 940 M€, focused on developing FCH technologies. It covered 5 activity areas (Transport, hydrogen production, stationary power generation, early markets, Cross-cutting). Financing projects is done through Annual Calls for

Proposals. A Council Decision of May 2014 has decided a continuation of the program with a total budget of 1330 M€ for the period 2014-2020. The FCH2 JU program has 2 Pillars, Energy and Transport, with in addition Cross-cutting domains. A significant change consists in financing more Innovation Projects (60% of the Budget). It aims at increased cooperation with National and Regional Initiatives.

This workshop was a joint initiative of the FCH-JU, in collaboration with the IPTS, CEA and the region Rhône-Alpes (Tennerdis).

2. THE MEETING

The core of the meeting consisted in exchanges between participants in specific parallel sessions. Each session was introduced by two keynote presentations, first from the point of view of a region that has concrete experience in the development of hydrogen projects, second on solutions proposed by industry. Keynotes were based on the state of the art, concrete projects, developments existing in regions/cities/end users and relations between regions and industry. Their goal was to start facilitated discussions between participants from a pragmatic and practical approach.

The workshop was a great success. 30 regions were gathered and presented a broad spectrum of initiatives and concrete projects. 85 participants attended the meeting and shared their experience in lively discussions. A great diversity of regions was present: Aberdeen, Aragon, Copenhagen, Flanders, North Denmark, Hamburg, Lombardy, North Rhine-Westphalia, Skane, etc. French regions were present, Basse-Normandie, Franche-Comté, Nord-Pas de Calais and Rhône-Alpes (Tenerrdis Cluster), etc. Eastern Countries were represented by Estonia, Latvia (Riga), Slovenia, Czech Republic. A Japanese delegation from NEDO was also present. Regions were very interested to exchange and share lessons learned. They were eager to explain in details their organisation and their achievements. Some have reached considerable experience and prepare important projects. For example, fig. 1 describes the structure of the Hydrogen Transport Economy in the North Sea Region.

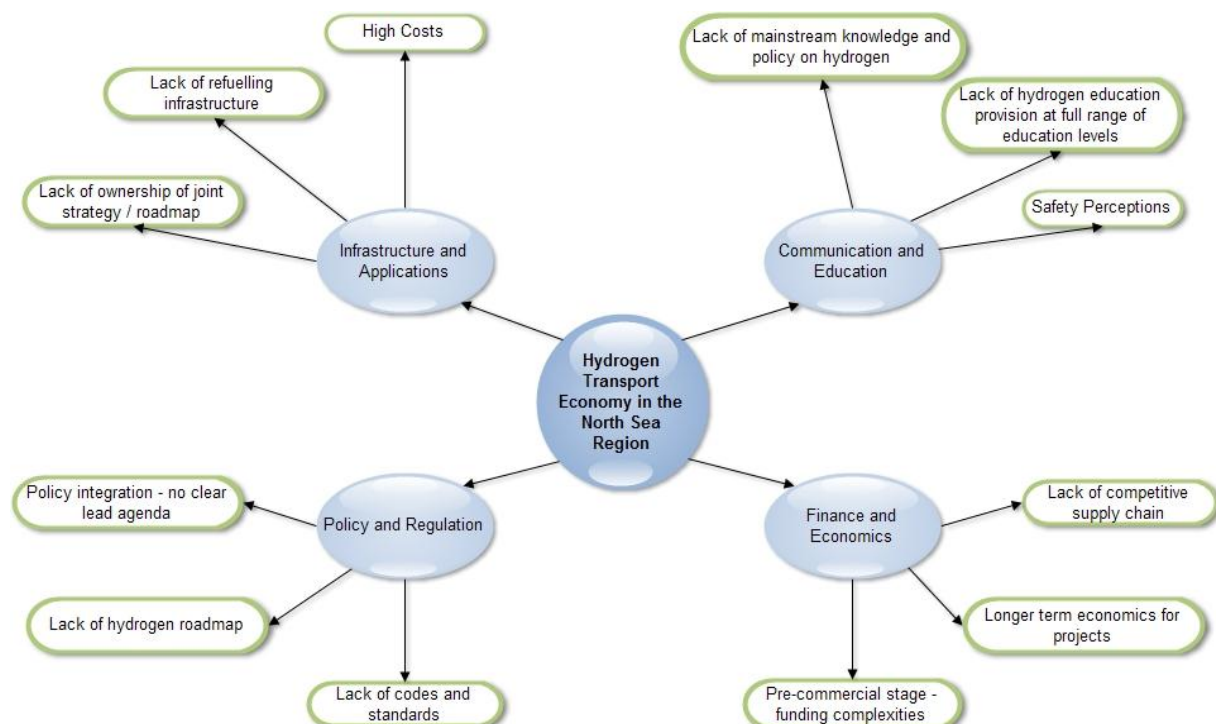


Fig. 1 Structure of the Hydrogen Transport Economy in the North Sea Region with a breakdown of the different problems that have to be dealt with (R. Sharp).

2.1 Clean public transport, role of fuel cell buses

Heinrich Klingenberg (hySOLUTIONS GmbH) and Paul Jenné (Van Hool) gave an exciting overview of the success of bus deployment in Europe (CHIC project). Many Cities are now interested to use hydrogen for clean urban transports. Joint efforts with the FCH-JU have led to a very successful program of bus deployment. A powerful coalition of **industry and public stakeholders** has been established. Several bus OEMs are now committed to accelerate the commercialisation of fuel cell buses. The cities of Hamburg, London, Riga and Rotterdam, in particular, have large scale projects. Hamburg is a leading city in environment and in the deployment of hydrogen vehicles, with a major effort on buses. Paul Jenné discussed in details the plan for cutting costs. A summary of the session was presented by Nicolas Brahy, FCH JU. The ambition is to involve more cities and regions, to have bigger fleets and reach a number of 1000 buses. Fuel Cells buses and Hydrogen can fit easily under the umbrella of the European Structural and Investment Funds. There is a bright future for hydrogen buses.

2.2 Combination of renewable energies and hydrogen

Rachel Sharp, Hydrogen Transport Economy for the North Sea Region, presented the energy and transport policy of Aberdeen. **The main driver of the region is economics.** The city sees its long term future as **The Energy City**, based on a low carbon economy (not just oil and gas). The central idea is to develop a supply chain – retain and attract businesses, develop transferable skills and retain skilled workforce. The City efforts are focused on air quality, carbon targets and renewables capacity. She received a lot of attention by detailing the process illustrated in fig.1 that the city has developed, the lessons learned and the following steps.

2.3 Power to gas

Several Power to Gas demonstrators already exist in Europe

Country	Projects	Start	Power MW	Gas	Netwk	Electrolyser	Company
DE	Enertrag - Prenzlau	2011	6	H2	Gaz	Alcalin	Enertrag-McPhy-TOTAL
DE	Falkenhagen EON	2011	2	H2	Gaz	Alcalin	Eon-Ontras-Hydrogenics
DE	AUDI - Wertle	2013	6	CH4	Gaz	Alcalin	EWE-ETOGAS
Italy	INGRID Puglia	2013	1,2	H2	Gaz		ENEL-McPhy-Hydrogenics
DE	Thüga AG Frankfurt	2013	0,32	H2	Gaz	PEM	ITM Power-Thüga
DE	Hamburg- EON	2014	1	H2	Gaz	PEM	Eon-Hydrogenics
France	GRHYD - Dunkerque	2014	0,12	H2 and Hythane	Gaz	PEM	GDF SUEZ McPhy- CEA AREVA H2Gen
France	MYRTE	2013	0,25	H2	Elect.	PEM	Univ.Corse - 4REVA H2Gen CEA

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Fig.2 Some Power to Gas projects in Europe (Ph. Boucly)

Philippe Boucly, GRTgaz, introduced the topic of Power to Gas in the Energy Transition and gave examples of deployment in France. He presented analyses and prospects in long terms scenarios. Gas infrastructure is an essential component of a global sustainable energy system. Hydrogen has an important role for developing renewable energies. His conclusions are the following:

- Power to Gas is a mature technology. The various technological components are available. Even is R&D is still necessary, the crucial need is to build demonstrators. This is the best way to have realistic economics models, to improve components and optimise complete systems.
- Power to Gas brings flexibility to the electric network and allows one to integrate renewables energies in the energy system. *It is the only way to massively store electricity from one season to the following one.*
- Power to Gas uses existing infrastructure. However, it will require a greater cooperation between network operators. It will oblige to increase the dialogue between the energy providers of the various sources, renewables, oil, gas, nuclear, etc.

2.4 Presentation of FCH JU studies

Two reports were presented:

- Commercialisation of bus presented by Nicolas Brahy;
- Fuel Cells Combined Heat Power and distributed generation presented by Mirela Atanasiu.

Both reports can be found on <http://www.fch.europa.eu/>

2.5 Regional initiatives towards cleaner mobility (public and private fleets, last mile delivery, etc.)

Frank Koch, North Rhine-Westphalia (Germany) reviewed the strong commitment of the NRW Agency, a non-profit organization, working on behalf of the NRW State Government, founded in 2000. They support the establishment of a demand oriented and sustainable hydrogen energy economy and create new working places. 120 FC and H₂ projects with 120 million € funding (NRW + European Regional Development Fund) and 190 million € expenditures have been initiated: Hydrogen production, Hydrogen Infrastructure, Filling Stations, Vehicle development and deployment, Stationary applications, R&D and special market applications.

NRW believes that one should keep away from “bricolage-type” of vehicles! The risk is to disappoint and lose public acceptance. Public Transport has important role for FCV market introduction (high visibility) and hydrogen refilling infrastructure set-up (high H₂ demand). Filling stations have still a variety of “technical problems”: compressors, valves, control devices, communication with user terminal, gas measurement. NRW continues its participation in EU Bus Studies and Procurement Projects. Combination of “corridor” and “cluster” distribution of sites. Sources of hydrogen must be diversified, switch from “brown to green” hydrogen. Co-operation with other regions and EU-wide harmonization of regulations and strategies is a must: Permitting procedures, H₂ Gas Quality, Authorization, Payment (Roaming, H₂ Credit Card), 35/70 MPa-Stations, HRS Corridors.

2.6 The French H2 Mobility Consortium

Fabio Ferrari, CEO Symbio FCell described the first 2 demonstration projects that have been developed by H2 Mobility France Consortium: the first one in the cities in the region Rhône-Alpes in the cities of Lyon and Grenoble. 40 light commercial vehicles, using Symbio Fcell range extenders installed on Renault Kangoo H2, have been sold to a variety of customers with the support of the region and Environment and Energy Management Agency (ADEME). They are used mostly for urban delivery, where these vehicles bring significant economic interests. The plan is to use vehicles using

green hydrogen from renewable energies. Hydrogen will be produced by McPHY Energy electrolyzers from hydroelectricity produced by the power companies CNR in Lyon and GEG in Grenoble, at an acceptable price for customers. CEA is in charge of the evaluation in a quantitative way of the performances of the systems. Symbio FCell will deliver 200 vehicles with range extenders this year and plans to sell 1000 vehicles next year and in 2017 between 3000 and 5000 vehicles.

2.7 Role of hydrogen in energy independence and security

Mikael Kau, Hydrogen Valley - Northern Jutland (Denmark) explained that the main driver of the region is a strong national commitment. Denmark has an ambitious energy policy (by 2050 no fossil fuels & 50% from Renewable Energy Sources). H2 Valley is a non-profit knowledge and business centre. Its activities are facilitating, networking, fundraising and building business models for green transition. The Hydrogen Valley Hub centre is located in Hobro and works in close cooperation with companies, organizations and public authorities. It focuses on bioenergy, electrolyser, methanation and mobility.

The challenge is to demonstrate that it is possible to balance the power grid due to an increasing integration of electricity from fluctuating energy sources such as wind and solar, and the challenge of producing transportation fuels that can satisfy both the need for driving comfort and sustainability as well as being competitive from an economic point of view.

- 200 jobs have been created directly and indirectly in RND in the FCH-sector (Danterm Power and Serenergy).
- > 30 million € public funding: EU Regional funds invested in facilities and project activities in the FCH-sector.
- Leading international private companies attracted to invest in RND due to green demonstration possibilities.

A workshop between Denmark and France regions was organised just after the S3 meeting by Tennerdis.

2.8 Balancing the Grid with Electrolysers – Using Power to Gas

Lucas Bertrand, ITM Power, reviewed the importance of electrolysers for grid balancing and energy storage services, and for the production of clean fuel for transport, renewable heat and chemicals. ITM electrolyser solutions benefit from a rapid response, high pressure; they are modular and scalable. Two examples illustrate demonstration projects in Europe built with the London and Frankfurt regions.

Thirteen companies of the Thüga group have combined their know-how and capital in a project platform to jointly invest in the development of Power-to-Gas storage technology. ITM Power's proton exchange membrane (PEM) electrolyser is the core of the system installed in Frankfurt am Main. The project is supported by the Hessian Ministry for the Environment, Energy, Agriculture and Consumer Protection and uses EU structural funds. Following the first phase of the project, the participants are considering a second project, which would use hydrogen and carbon dioxide to produce synthetic natural gas to be subsequently stored. The gas mixing plant ensures that the mixture of hydrogen in the gas distribution network does not exceed 2% by volume. That means, when too much power is on the electrical grid, at the request of the transmission system operator (TSO), the load of the electrolyser will be increased. In this case, the plant absorbs the excess power and converts it into hydrogen. This also contributes to the stability of the power grid. Final acceptance of the plant was achieved at the end of March 2014.

HyFive is a pioneering £31 million project, supported by the FCH JU, involving leading motor manufacturers, hydrogen fuel suppliers, the Mayor of London's Office and energy consultancies to make hydrogen vehicles a viable and environmentally friendly choice for motorists across Europe.

ITM Power was selected by the London Hydrogen Partnership to be the Hydrogen Refuelling Station partner for London. The three 700 bars stations fuelling stations will be added to the other 12 stations of the network. Working with other partners in the project, Air Products, Linde, OMV and the Copenhagen Hydrogen Network, will stimulate the network density required for full commercial roll-out of hydrogen refuelling and FCEVs across Europe.

3. Outlook

Intense discussions between participants have shown the considerable interest of regions to exchange information on building successful projects. Region that have developed a cluster approach are clearly better prepared to develop important projects (in particular, Hamburg, London, NRW, Rhône-Alpes etc.). Spreading information, increasing communication and better coordination were general requests of the participants. All participants highlighted the importance of the FCH JU to develop their projects. The initiative of the FCH JU to organize this workshop was most welcome. However, more preparatory work should be done in particular concerning economics and smart specialisation. Regions would need a common framework to share their ideas and be better associated to the FCH JU. Key questions are:

- Strong political engagement of regions (a political champion) for cooperation in European strategic priority areas on the basis of smart specialisation;
- Upgrading regional clusters into world-class clusters through inter-regional cooperation and networking;
- Focus on an investment boost in demonstrators and pilots;
- Industry needs to think from a customer perspective: (FC) busses are well known to operators, hydrogen completely not : a full package turnkey should be offered;
- An ongoing need for technology marketing: the full benefits of FCH technologies are not (yet) widely understood. There is a need to change the Fuel Cell bottom up (push) approach to (one day) a top down (demand) approach.

The Participants unanimously requested a follow-up of this workshop by means of dedicated discussions and advanced sharing of information and best practices, concrete examples and regional success stories on more specific and concrete subjects. In this respect, the FCH JU will organise dedicated workshops on “regional applications of Fuel Cell Busses” and on “ Fuel Cells for back-up power” within the coming year at a location which will allow participants to visualise and experience actual installations or vehicles. More information will appear on the FCH JU website in the coming months. The FCH JU is open to organise other thematic workshops based on regional requests.