The Fuel Cells and Hydrogen Joint Undertaking

Program Review Days 2012

Bert De Colvenaer, Executive Director Brussels, 28 November 2012



- FCH JU Program alignment with MAIP
- FCH JU Project dissemination
 + EC Project dissemination
- Annual project follow up
- Networking



Agenda 28 November

08.30-09.00 : welcome and objectives, presentation of the study on investments and job trends in the FCH sector, Bert De Colvenaer

	Demonstration activities in road transport	Fuel cells Degradation aspects	Sustainable Hydrogen production
09.00 - 09.30	H2moves	DEMMEA	Primolyzer
09.30 - 10.00	CHIC	MCFC-CONTEX	Nexpel
10.00 - 10.30	High V.LO City	ROBANODE	ELyGRID
10.30 - 11.00	Presentation of the bus study	KEEPEMALIVE	RESelyser

Coffee break

	Demonstration activities in road transport	Fuel cells Degradation aspects (cont)	Hydrogen production and purification activities
11.15 - 11.45	HyTEC	PREMIUM ACT	CoMETHy
11.45 - 12.15	FCGEN	LOLIPEM	NEMESIS2+
12.15 - 12.45	Desta	STAYERS	Hy2Sep_2
12.45 - 13.15	Pemican	SOFC-Life	

Lunch

	Demonstration of Stationary applications	Sustainable hydrogen production and solid state storage	Stationary applications proof-of- concepts and System components development
15.00- 15.30	SOFT-PACT	Hydrosol-3	LOTUS
15.30 - 16.00	CLEARGen demo	Artiphyction	SOFCOM
16.00- 16.30	Ene-field	Hytime	ASSENT
16.30 - 17.00	Coffee break		
17.00 - 17.30	FC-District (FP7 project)	SSH2S	CATION
17.30-18.00	H2SUSBUILD (FP7 project)	Bor4Store	
18.00 - 19.00	Reviewers meeting: exchanges and consolidation of assessment		

Agenda 29 November

	Material handling	Sustainable Hydrogen production	New materials and stacks for FC applications
09.00 - 09.30	Hylift-Demo	Adel	Eureca
09.30 - 10.00	Mobypost	Electrohypem	RAMSES
10.00 - 10.30	Shel	OCEAN (FP7 Project)	SCOTAS-SOFC
10.30 - 11.00			Maestro

Coffee break

	Operation diagnostics tools for stationary applications	Hydrogen distribution and large scale storage	New materials for FC applications
11.15 - 11.45	GENIUS	HyUnder	Metsapp
11.45 - 12.15	D-CODE	Deliverhy	Metprocell
12.15 - 12.45	DESIGN	Idealhy	MMLCR+ SOFC
12.45-13.15		INGRID (FP7 project)	Laser-cell

Lunch

	Portable applications	Pre-normative research & Life cycle assessment activities	Socio economic and benchmarking activities
14.30 - 15.00	DURAMET	HyQ	FC-Eurogrid
15.00 - 15.30	SUAV	HyCOMP	Temonas
15.30 - 16.00	ISH2SUP	Hyindoor	H2FC (FP7 Project)
16.00 - 16.30	IRAFC	FC-HyGuide	

Coffee break

	Back-up and off-grid power applications	Training and regulatory aspects	Stationary applications proof-of- concepts and System components
16.45 - 17.15	FITUP	TrainHy-Prof	Reforcell
17.15 - 17.45	FCPowerdRBS	HYPROFESSIONALS	Asterix 3
17.45 - 18.15		HyFacts	Flumaback
18.30 - 19.30	Reviewers meeting		4



Study on the trends in terms of investments, jobs and turnover in the Fuel Cells and Hydrogen sector

Final document

5 October 2012

Executive summary

This document contains data from:









FC&H industry has grown substantially over the last years

Fuel cells and hydrogen production have a great potential to contribute to overcoming the energy and environmental challenges facing Europe. For example, hydrogen fuel cells in mobility reduce CO₂ emissions without range and performance limitations of alternative low emission technologies. Stationary fuel cells offer clean and easily transportable energy storage, and energy storage with hydrogen offers good solutions for increasing intermittency effects from renewables

The industry in Europe has done well since the FCH JU's inception in 2007: per annum, turnover increased by 10%, R&D expenditure by 8%, and Market introduction expenditure by 6%. The global fuel cell industry output has increased with 29% per annum in terms of power, with the EU remaining a smaller market than the US and Asia. Employment and number of patents granted in the EU FC&H sector outpaced the average economy. Multiple large scale power storage demos are in the process of being built. Private funding has been the largest contributor, and growing, while public funding has remained stable. However, broad public support is still essential for the success of FC&H technology according to industry experts

Over the next years, the industry expects to continue to blossom

Survey respondents expect major FC&H applications to become commercial by 2020, although slower than anticipated in 2007. The FC&H sector is building momentum worldwide and within the EU. Respondents expect rapid growth in turnover and RD&D in all sectors. As a result, job creation is expected to increase to 9% per annum

However, the industry needs to overcome a couple of critical challenges

Success for the European FC&H sector requires addressing and overcoming several critical challenges. Commercialisation timeline systematically falls behind estimates, leading to uncertainty for investors and customers; cost and/or performance need to improve significantly. Large infrastructure investments are necessary for FC&H transport sector to materialize, posing a chicken-and-egg problem. Both small and large companies see a strong need for funding the nascent industry. Competition from other regions is strong, with Europe public funding behind the Americas. Lastly, public awareness and acceptance of hydrogen is low, and there is a risk of backlash, as happened with biofuels

To overcome these challenges, continued public support in the coming years is seen to be essential

According to the survey respondents and interviewees, the EU should keep investing in fuel cells and hydrogen in 2013-20, and maintaining consistent policies to overcome the critical challenges. In order to improve performance and cost significantly, a joint strategy is needed. A consistent and coordinated investment policy is seen as crucial to ensure the survival of the nascent FC&H industry: demand of fuel cell technology will only pick up when the supply side has matured sufficiently and vice versa. To ensure commercialisation, substantial public funding is still required and expected according to respondents. Furthermore, these investments help sustain the competitive position Europe currently has in mobility. Improving public awareness of value add of FC&H technology is also seen as a key objective. Public opinion should change from fear for safety to vocal support for carbon-neutral FC&H technology

According to the FC&H industry, the FCH JU has made valuable contributions, and also can improve on some topics

The FCH JU has successfully supported several projects and fund receivers. The EU FC&H industry leaders believe the FCH JU has done especially well in increasing RD&D investment, providing stability, providing one voice to policy makers, being a focal point for the industry, and providing strong support to it. They also think that, going forward, Europe has an opportunity to improve on overarching strategy, joint celebration of success, and execution speed and complexity of the grant application process

FC&H industry has grown substantially over the past 5 years, in turnover (10% p.a.), R&D expenditure (8% p.a.), and market introduction/deployment expenditure (6% p.a.)

Annual change experienced by survey respondents in the FC&H sector, 2007-11/12



Trend of increased turnover and market development shows industry is preparing for commercialization

1 Excluding respondents that have not answered this question

2 Total of all survey respondents. Note that R&D spend question was answered by about twice as many beneficiary respondents as the other two

New Energy Wor

uel cells & hydrogen for sustai

Average change p.a.

Change in annual

amount², EUR

X%

X mln

Employment and number of patents granted in the EU FC&H sector outpaced the average economy



1 CAGR = Compound Annual Growth Rate 2 These figures exclude associated employment at, e.g., suppliers, and substitution effects

SOURCE: Employment figures from FCH JU survey; Patent search: Thomson Innovation

New Energy W

The global fuel cell industry's output increased with 29% per annum in terms of power, with the EU remaining the smallest market

MW shipped



SOURCE: Fuel cell today industry review 2012; World Electric Power Plants Database (UDI)

New Energy Wor

Private funding has been the largest contributor, and growing, while public funding has remained stable



Expenditure for FC&H in the EU¹ EUR million Upper range is the sum of 46 (IG) and 106 (Ben.) responses to survey guestion I.1.2-3 Lower range is the sum of 39 (IG) and 75 (Ben.) responses to survey question I.1.4 500-1,400 Private³ 500-1,300 Total private 400-1,100 funding 2005-10 is 400-1,000 between EUR 2.5 400-900 - 6.6 bln 19 19 300-900 Other EC 19 19 67 67 67 60 67 FCH JU² 60 200 183 174 168 162 National budgets

1 Public support numbers exclude deployment expenditure

06

123

2005

2 Funding divided uniformly over all years of FP7. In reality, the FCH JU was starting up in 2007 and 08 and funding in those years was lower 3 Note that the survey covered most, but not the entire, industry. Numbers rounded to 100's

08

09

2010

SOURCE: RD&D budget split from FCH JU survey; public support for FC&H from OECD/IEA statistics

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Survey



Desk research

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Over the next years, the industry expects to continue to blossom

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New Energy World

fuel cells & hydrogen for sustainabilit

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The FC&H sector is building momentum worldwide and within the EU





Over the next years, the industry expects to continue to blossom

Respondents expect rapid growth in turnover and RD&D in all sectors

D in

CAGR¹, N = 33 (IG), 30 (Beneficiaries)



Total increase in annual amount from 2013 to 2020



1 CAGR = Compound Annual Growth Rate SOURCE: FCH JU survey Over the next years, the industry expects to continue to blossom

As a result, job creation is expected to increase to 9% per annum

N = 46 (IG), 107 (Beneficiaries)



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Success for the European FC&H sector requires addressing and overcoming several critical challenges



Challenges facing the FC&H industry

- Commercialisation timeline systematically falls behind estimates, leading to uncertainty for investors and customers
- Chicken and egg problem Large infrastructure investments necessary for FC&H transport sector to materialize, and vice versa
- 3 Nascent, not yet commercial, industry still requires support
- Competition of investment flowing to US and Asia requires stable EU investments to ensure (future) jobs and deployment

5 Low public awareness and press for FC&H technology

To overcome these challenges, public support will continue to be essential in the coming years

Competition from other regions is strong, with Europe public funding behind the Americas



Governmental RD&D budgets for FC&H¹ EUR millions



"Installations of large stationary fuel cell power systems to date have mostly been in the USA and South Korea, and both these markets are experiencing rapid growth"

- Fuel cell today industry review 2012

"US lost momentum – and Korea/Japan are too closed; EU is progressing fast, it will be a pilot market; activities of FCH JU are showing results"

- Car manufacturer

"The US shale gas boom has reduced the focus on efficient use of fossil fuels. This might lead to a less attractive R&D and investment climate in the US – with potential spill-overs to the EU"

- EU government

"Germany is almost at Japan/Korea level; NOW with very important role; the rest of Europe, particularly Southern Europe, has almost zero momentum" – EU Car Manufacturer

 1 In 2010 EUR terms and exchange rates
 2 US and Canada
 3 Australia, Japan, Korea and New Zealand

SOURCE: OECD/IEA statistics; Fuel cell today industry review 2012; Interviews with FC&H industry players

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Success for the European FC&H sector requires addressing and overcoming several critical challenges



Focus of this section

Challenges facing the FC&H industry	How should EU/FCH JU overcome these challenges
1 Commercialisation timeline systematically falls behind estimates, leading to uncertainty for investors and customers	 Create a joint strategy on commercialisation, focused on performance improvements and/or cost reductions Ensure effective legislation
2 Chicken and egg problem – Large infrastructure investments necessary for FC&H transport sector to materialize	 Set up collaborative initiatives to ensure joint infrastructure investments
3 Nascent, not yet commercial, industry still requires support	 Continue public funding programs Promote sector to attract private funding
4 Competition of investment flowing to US and Asia requires stable EU investments to ensure (future) jobs and deployment	 Finance projects based on potential value and feasibility
5 Low public awareness and press for FC&H technology	 Increase public awareness of value added FC&H sector

To overcome these challenges, continued public support in the coming years is seen to be essential

To improve performance and cost significantly, a joint strategy is needed (2/2)



"Asia has a leading role in the field of H2 infrastructure and FCEV. Reasons are: more focused plans/strategies of governmental institutions with closer contact to industry players; Asian supplier landscape for FC&H technologies is more advanced than in EU and US"

- EU Car manufacturer

"Japan and Korea are most progressive in terms of FCV and station ramp-up plans; close interaction between government and large private companies is a competitive advantage"

– EU Car manufacturer

"FCH JU funding/support roadmap needs to be clearer and more predictable, so that companies have an understanding which areas/projects (e.g., H2 production, car demonstration) will be funded/supported in the mid-/longer term and, hence, can direct own projects/investments"

- Gas producer

"FCH JU is doing the right thing, it should be more strategic, and overarching on the infrastructure"

- Asian Car manufacturer

Chinese government prescribed cities to have 1,000 electrical or hybrid buses, which has generated a lot of new business in the country

– Bus manufacturer

To overcome these challenges, continued public support in the coming years is seen to be essential

34 To ensure commercialisation, substantial public funding is still required and expected according to respondents





1 Expenditures include R&D and Market introduction/deployment

SOURCE: FCH JU survey; Interviews with FC&H industry players

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Since its inception, the FCH JU has ignited investments across the industry





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There are a 4 things the FCH JU has done exceptionally well

Stability	 "There is stability and long term commitment. Without the FCH JU, our board would have already exited the business" "Other companies can build on the FCH JU"
One voice	 "We have one voice to regulators – much better than other techs" "The FCH JU creates enormous leverage – it provides one strong united voice to policy makers and to stakeholders abroad" – O&G Company
Central focal point	 "Companies in other regions can now easily find us – and they connect to us (Hyundai, Toyota)" "It is a vehicle to build coalitions – without the FCH JU, H₂M would not be there" "International cooperation will remain important. The role of the FC JU is pivotal in this – to keep all parties together" – O&G Company
Strong support	 "We have supported nascent technologies" "FCH JU delivers support that local nor private programs can give" "Speed of going from request to grant has significantly improved"

According to the FC&H industry, the FCH JU has made valuable contributions, and also can improve on some topics

FCH JU should also improve on a few things

Overarching strategy	 "We should have an overarching agenda across segments what we want to do, and what not" "We must rationalize – let's cut support on 'dead horses'" "Effectiveness of EC support is limited due to selection criteria oriented to fulfill formal targets (e.g., aspired number of SME's having received funding by 20xx) than content-driven objectives of project and expected value add (e.g., R&D progress)" – O&G company "There are difficulties in coordinating and participating as a foreign company; for us, it is better to have a tender (HytEch or Next Move)" – Asian car manufacturer "Development of FCH JU is disappointing with respect to its original target to increase integration of the industry in funding decision making processes and reduction of bureaucracy" – EU Car manufacturer "The FCH JU could play a role in coordinating or aligning the individual national initiatives, such as H2M Germany, H2M UK, H2M France" – Car manufacturer "FCH JU needs to think of a combination of programs with national programs" – Stationary player
First success	 "The FCH JU will fail if H2M does not make it" "FCs have been the 'new promise' for decades –they will not survive if they do not soon commercialize" "We must have good milestones, so we can celebrate" "Going forward, increase funding of projects close to market readiness; decrease basic R&D funding¹" – EU Car manufacturer
Execution speed and complexity	 "Speed of request to grant must increase further" "The FCH JU funding application process is more complex and time consuming than EC programs such as FP7, and has a lower funding rate" "Going forward, reduce the level of bureaucracy" – EU Car manufacturer
Also heard	 "Promote current SAE standards for EU (already in US and Asia); do not reinvent the wheel" – EU Car manufacturer "We don't interact too much with FCH JU – we leave it to small companies. Our time will come!"

1 Background for previous allocation to R&D areas is that FCH JU funds originally stem from the Research Grouping

SOURCE: Interviews with FC&H industry players

Thank you for your attention !

Further info :

- FCH JU : <u>http://fch-ju.eu</u>
- NEW-IG : <u>http://www.fchindustry-jti.eu</u>
- N.ERGHY : <u>http://www.nerghy.eu</u>