Eco-Mobility 2014

Strategies, Technologies and R&D-funding programmes for the Market Introduction of Alternative Propulsion Systems and Fuels

Fuel Cell & Hydrogen Research at the JRC as well as R&D-Programs and -Strategies of the European Commission

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European Commission

Contents

- **EU Energy and Transport Policy**
  - ***Energy and climate framework 2030***
  - ***Alternative Fuels Infrastructure Directive***
- **Fuel Cells and Hydrogen Joint Undertaking**
- **FCH activities at JRC**

European Commission

20-20-20 by 2020

Two pillars of EU energy and transport policy to reach integrated climate and energy objectives:

- ***Legislation***
- ***Support to technology innovation (Flagship Innovation Union of Europe 2020 Strategy, SET-Plan, STT–Plan, Eco-Inno Action Plan)***

FCH in EU Policy documents

role of hydrogen as energy carrier and

fuel cells as efficient energy converters

to contribute to low carbon EU energy and transport system are recognized by EU policy-makers

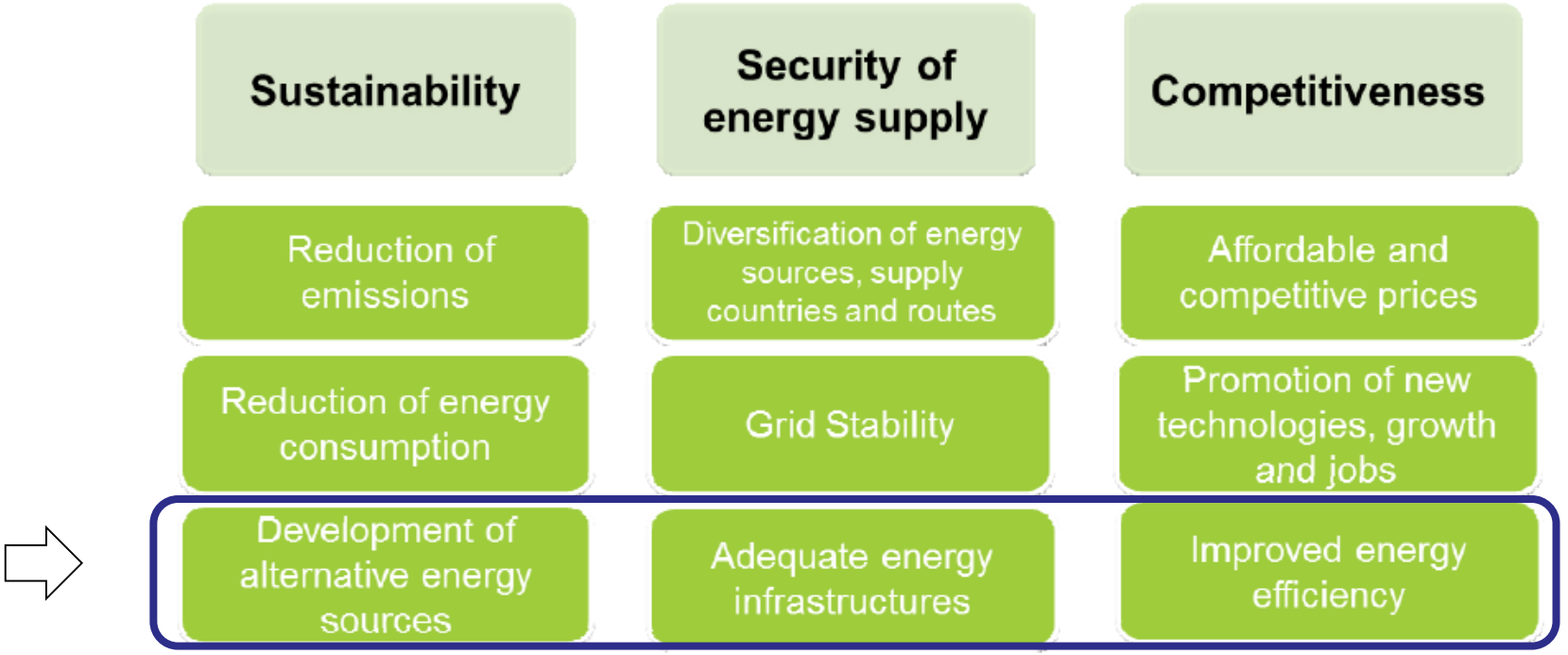
- **A Roadmap for moving to a competitive low carbon economy in 2050**
- **Energy Roadmap 2050**
- **SET-Plan**
- **Communication Energy Technologies and Innovation**
- **Transport White Paper**
- **Directive Alternative Fuels Infrastructure**

- **FCH technologies can contribute to EU energy and climate package 20-20-20 by 2020 and beyond.**
- **In the frame of economic recovery, there is also the target of 20% contribution by industrial sector to EU-GDP *(New Industrial Policy)*.**

FCH technologies can also contribute to that 20% target

2030 Policy Framework

The 2030 framework must ensure progress towards three objectives



in *transport*, *power* and industrial sectors } **EU-level action**

Energy Infrastructure Priorities for 2020 and beyond

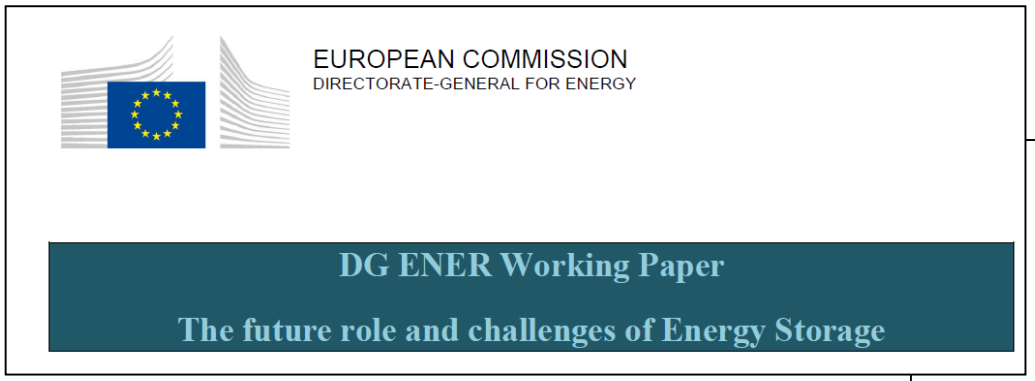
European Commission

REGULATION (EU) No 347/2013 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL

of 17 April 2013

on guidelines for trans-European energy infrastructure and repealing Decision No 1364/2006/EC and amending Regulations (EC) No 713/2009, (EC) No 714/2009 and (EC) No 715/2009

- **Infrastructure for electricity, gas, oil, CO2**
- **H2 infrastructure not explicitly included, but H2 is enabler**



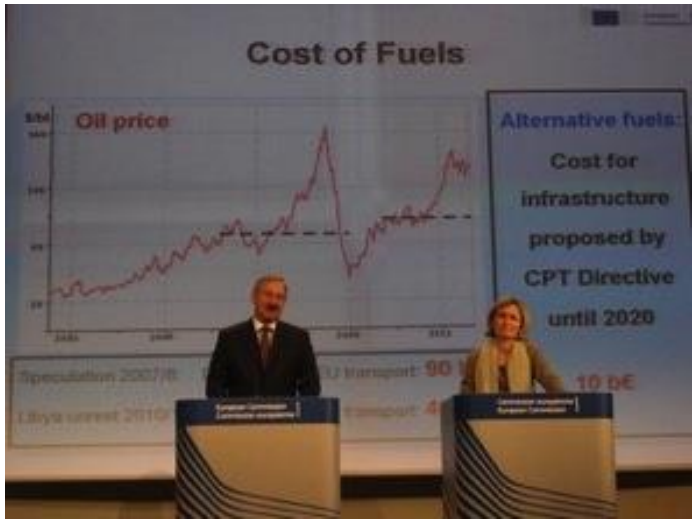
Clean Power for Transport Package

European Commission

- **EU committed to significantly reduce its GHG emissions – at least 80% by 2050**
- **Emissions in road transport may need to be cut by as much as 95%**

Directive on the deployment of alternative fuels infrastructure

- ***Build a competitive and resource efficient transport system***
- ***Establish a long term fuel strategy***
- ***Remove technical and regulatory barriers***
- ***Facilitate a single market for alternative fuels vehicles and vessels***



European Commission

Alternative Fuels for Transport

	Road						Air	Rail	Water		
											
Range	*Urban*	*Medium*	*Long*	*Short*	*Medium*	*Long*			*Inland*	*Short sea*	*Maritime*
Natural gas					LNG	LNG	✗		LNG	LNG	LNG
Electricity		✗	✗		✗	✗	✗			✗	
Biofuels											
Hydrogen						✗	✗			✗	

Alternative Fuels Infrastructure

European Commission

Bundesministerium für Verkehr, Bau und Stadtentwicklung

Energie für Deutschland

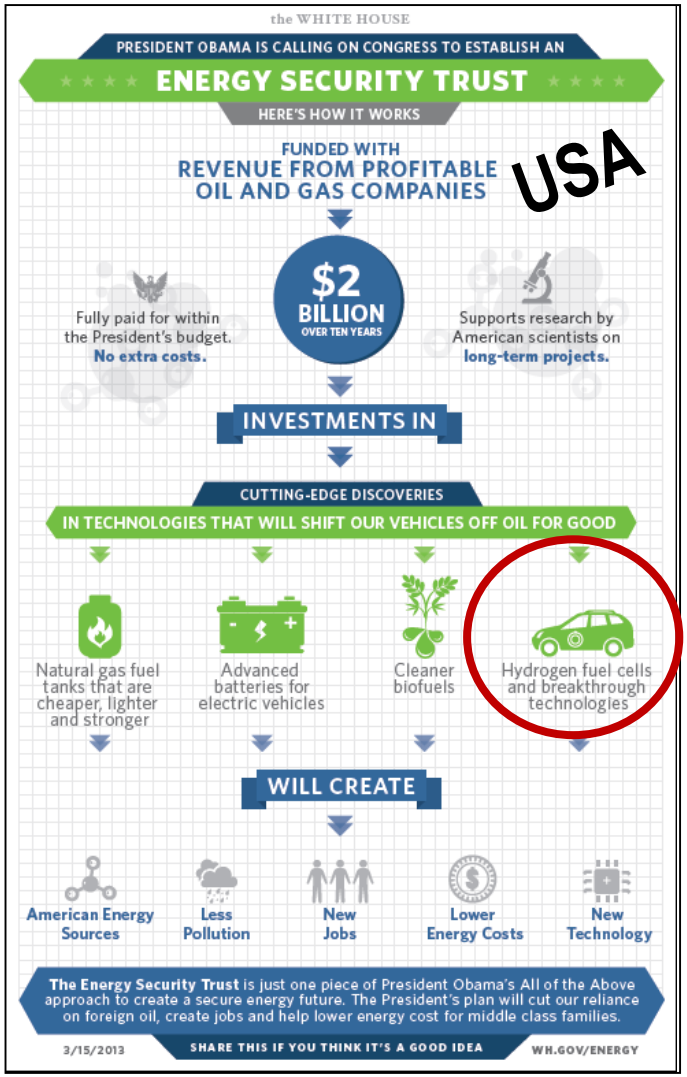
Die Mobilitäts- und Kraftstoffstrategie der Bundesregierung (MKS)

DE

Energie auf neuen Wegen

GB

Action for Roads
A network for the 21st century



Directive on Alternative Fuels Infrastructure

1) **Geographical coverage: In those Member States which decide to include hydrogen refuelling points accessible to the public, an appropriate number of HRS including cross-border links where appropriate, has to be established by the end of 2025**

2) **Common technical specifications EU-wide by end 2016**

3) **User information, including a clear and sound price comparison methodology**

Directive on Alternative Fuels Infrastructure

Annex III.2 Technical specifications for hydrogen refuelling points for motor vehicles	Relevant international standardisation activities ISO TC 197:
2.1. Outdoor hydrogen refuelling points	• WG24 on HRS
2.2. hydrogen purity	• ISO 14687-2 (2012); harmonized with SAE-J2719
2.3. fuelling algorithms and equipment	• NWIPs dispenser and components; WGs started 2013
2.4. Connectors	• ISO 17268 based on SAE-J2600

European Commission

HIT Project: Hydrogen Infrastructure for Transport (TEN-T)

- define optimum strategies to migrate from H2 hotspots in densely populated areas to actual local markets for H2 Refuelling Stations (HRS) and from there to long distance transport and mobility along the Trans-European Transport Networks' (TEN-T) corridors.

- develop National Implementation Plans (NIP) for France, Sweden, Denmark and the Netherlands.

Budget: 6,9 M€ (EU contribution: 50%)
Start April 2012 – End Dec. 2014
http://tentea.ec.europa.eu/download/project_fiches/multi_country/fichenew_2011eu92130s_final.pdf

Trans-European Networks for Transport

REGULATION (EU) No 1315/2013 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL

of 11 December 2013

on Union guidelines for the development of the trans-European transport network and repealing Decision No 661/2010/EU

EU financing from

REGULATION (EU) No 1316/2013 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL

of 11 December 2013

establishing the Connecting Europe Facility, amending Regulation (EU) No 913/2010 and repealing Regulations (EC) No 680/2007 and (EC) No 67/2010

H2 for road transport fully eligible,
incl. market-side innovation (no R&D) 250-400 M€ up to 2020

- Biggest ever European R&I Programme for 2014-2020
- Budget of nearly 80 billion €
- Aiming at:
  - ✓ **boosting investment in growth & jobs**
  - ✓ **addressing people's concerns about living conditions**
  - ✓ **strengthening EU's global position in research, innovation & technology**
- International participation a key element

Public-Private Partnership
Industry led

European Commission

Fuel Cells & Hydrogen 2 Joint Undertaking

Industry Grouping
NEW-IG
76 members

European Union
represented by the European Commission

Research Grouping
N.ERGHY
59 members

Both the Industry Grouping and the Research Grouping are non-profit organisations with open membership

To bring to the point of market readiness
a portfolio of clean, efficient and competitive solutions
based on fuel cells and hydrogen technologies in energy and transport

FCH JU
Main Achievements

- ***155 R&D D** projects financed*
- *over **7** calls for proposal*
- *covering **5** application areas*
- *total value of **900 M €***
- *with **540** participants from **33** countries**:***
  - **more than 300 industrial companies**
  - **of which almost 50% SMEs**
  - **more than 70 research institutes**
  - **and more than 90 universities**
- *Strong participation of **Joint Research Centre***
- *international cooperation outside EC*
- ***Mature European FCH community :***
  - **Strong, visible and coherent**
  - **Consensus strategy (MAIP/AIP)**
  - **Pre-competitive collaboration**
  - **High SME participation**

Coalition Studies – preparing for deployment

- **A portfolio of power-trains for Europe, *finished***
  - **H_2MOB D, UK, F, …, *ongoing***
  - **A roadmap for financing hydrogen refuelling networks – Creating prerequisites for H2-based mobility, *finished***
  - ***H_2MOB Europe, thinking***

- **Urban Buses: alternative powertrains for Europe, *finished***
  - **FCH Buses phase 2, *starting***

- **Development of water electrolysis in the European Union, *finished***

- **Commercialisation study for distributed generation technologies in Europe**
- **The role of energy storage to enable intermittent RES in Europe**

www.fch-ju.eu

Fuel Cell and Hydrogen Community

+10%

average increase of annual **turnover** (on a 2012 total of €0.5 billion)

+8%

average increase of **R&D expenditures** (2012 total €1.8 billion)

+6%

average increase of **market deployment expenditures** (2012 total €0.6 billon)

+6%

growth in **jobs** per year (~4,000 FTE in 2012) while average EU job market has contracted

+16%

annual increase in **patents** granted in the EU to European companies (average 1.5% for all European industries)

Source: Trends in investments, jobs and turnover in the Fuel cells and Hydrogen sector, 2012

European Commission

Two key activity pillars

TRANSPORT

- Road vehicles
- Non-road mobile vehicles and machinery
- Refuelling infrastructure
- Maritime, rail and aviation applications

ENERGY

- Fuel cells for power and CHP
- Hydrogen production and distribution
- Hydrogen for renewable energy generation (incl. blending in NG grid)

CROSS-CUTTING ISSUES
(e.g. standards, consumer awareness, manufacturing methods, studies)

Strategic objective

By 2020, fuel cell and hydrogen technologies will be demonstrated as one of the pillars of future European energy and transport systems, making a valued contribution to the transformation to a low carbon economy by 2050

Budget of €1.4 billion in 2014-2020
Strong industry commitment to contribute inside the programme + through additional investment outside, supporting joint objectives.

FCH JU Stakeholder Forum 2014

- **Wednesday 12th November 2014**
- **The Hotel, Brussels, Belgium**
- **Open to all public; registration required**
- **Program Review Days on 10 and 11 November**
- ***More info on www.fch-ju.eu***

JRC's Mission and Role

… is to provide EU policies with independent, evidence-based scientific and technical support throughout the whole policy cycle

Direct research:
JRC is the European Commission's in-house science service and the only DG executing direct research; providing science advice to EU policy

Serving society,
stimulating innovation,
supporting legislation

JRC support to technology innovation: PNR

(1) Partner up with EU industry and research institutions

industry

policy

research

Identify R&D needs

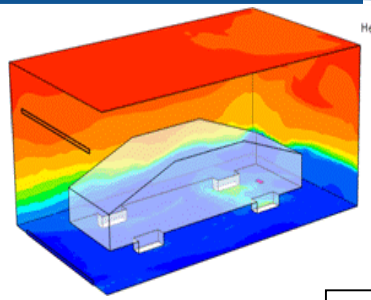
Perform priority R&D

Science-based input to Standards and Regulations

(2) Harmonise internationally

PNR on FCH at JRC

H2 storage

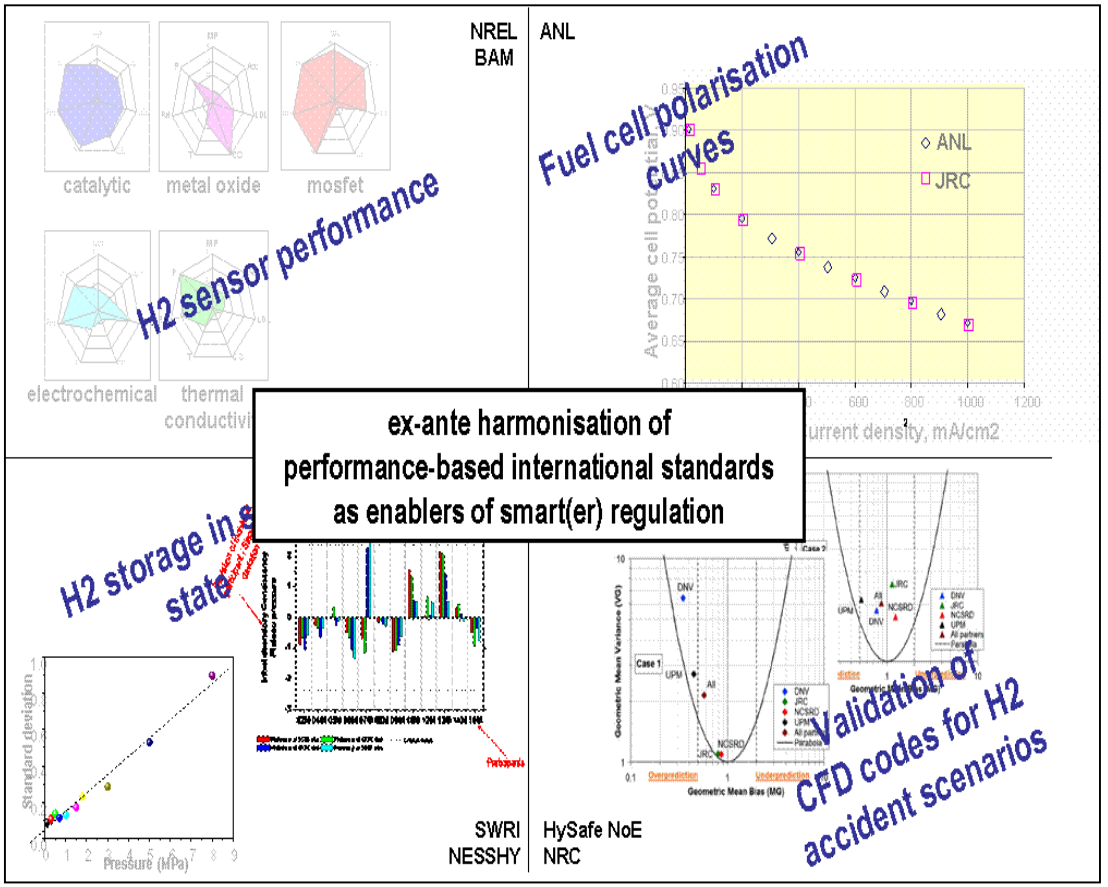


H2 safety

reformer

fuel cells, stacks
PEMFC, SOFC

H2 sensors



European Commission

Thank you for your attention!

JRC:

https://ec.europa.eu/jrc/

Contact: jrc-info@ec.europa.eu

marc.steen@ec.europa.eu

FCH JU : http://fch-ju.eu

NEW-IG : http://www.fchindustry-jti.eu

N.ERGHY : http://www.nerghy.eu

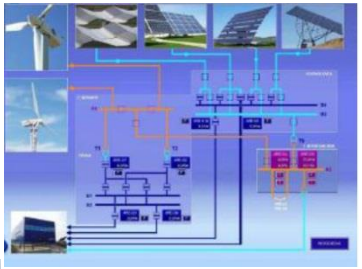
Back-up slides

Transport applications

- **Demonstration of >260 hydrogen cars**
- **Installation of >20 hydrogen refueling stations**
- **Demonstration of >74 hydrogen buses**
- **Demonstration of >400 hydrogen materials handling vehicles**
- **Demonstration of auxiliary power units for trucks, planes and maritime applications**

Hydrogen production and storage

- Demonstration of high power electrolysers coupled to renewable energy sources
- Demonstration of integrated systems
- Demonstration of hydrogen production through concentrated solar energy
- Hydrogen Underground storage



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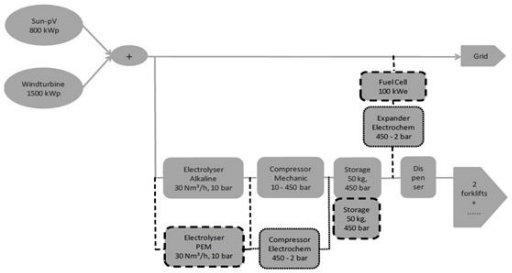

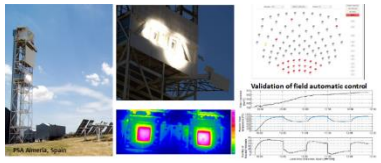

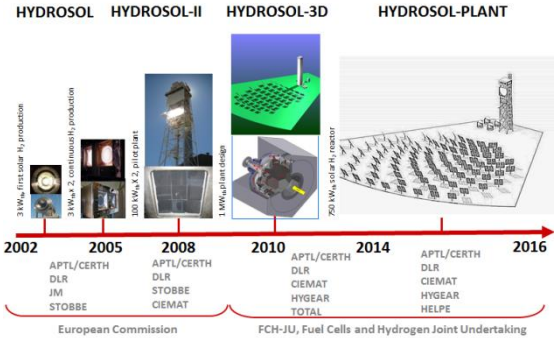

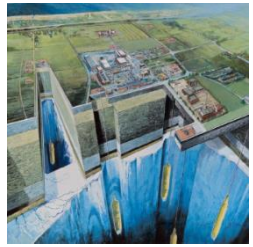

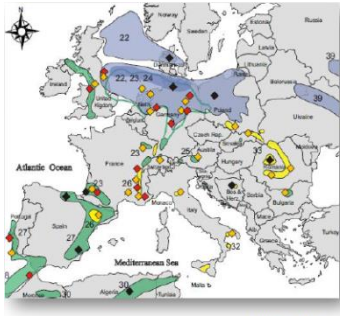

Source: KBB

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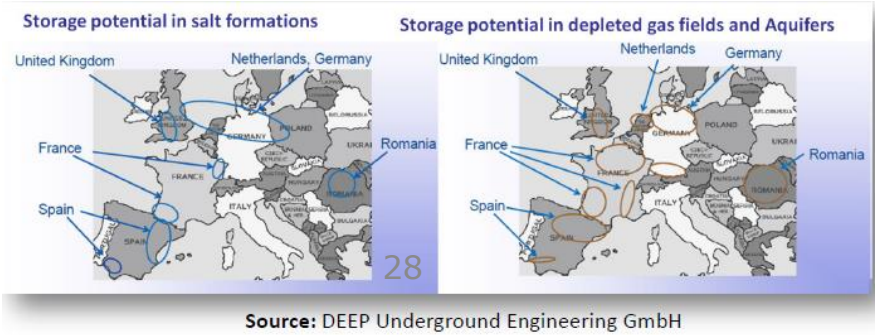

Source: DEEP Underground Engineering GmbH

Stationary applications (CHP and back-up power units)

- Demonstration of > 1000 residential micro-CHP units in 12 Member States (system efficiency > 95%)
- Demonstration of 3 industrial CHP projects >1,5 MW
- Demonstration of > 37 back-up power systems

ene.field SOFT-PACT FCpoweredRBS fitup

Objectives FCH2JU

1. ***reduce the production cost of fuel cell systems to be used in transport applications, while increasing lifetime to levels competitive with conventional technologies*** **industry**

2. ***increase the electrical efficiency and the durability of the different fuel cells used for power production while reducing costs, to levels competitive with conventional technologies*** **industry**

3. ***increase the energy efficiency of production of hydrogen from water electrolysis while reducing capital costs, so that the combination of the hydrogen and the fuel cell system is competitive with the alternatives available in the marketplace*** **industry**

4. ***demonstrate on a large scale the feasibility of using hydrogen as a competitive energy storage medium for electricity produced from renewable energy sources*** **policy**

European Commission

Budget :

Total : 1.33 B € = 665 M € (EC) + 665 M € (industry + research)

Administration : 2 * 19 M €

7 calls : 2014 - 2020

Funding distribution	Research and Innovation		Innovation		Total	
Transports Systems	94 (±5)	14.5%	213 (±10)	33%	307	47.5%
Energy Systems	94 (±5)	14.5%	213 (±10)	33%	307	47.5%
Cross-cutting activities					32	5%
Total	192	29%	426	66%	646	100%

European Commission

Directive on the deployment of alternative fuels infrastructure (AFI)

- **requires <u>Member States</u> to adopt national policy frameworks and notify them to the Commission by end 2016**
- **requires the <u>European Commission</u> to:**
  - facilitate the development and implementation of the NPFs through the ***exchange of information and best practices***
  - assist MS in the ***reporting on the NPFs***
  - assess and report on the coordination and ***coherence of the NPFs at EU level***
  - ***publish and update the information on the national targets and the objectives*** submitted by each Member State on a regular basis