

Fuel cells and hydrogen

Joint undertaking

The Fuel Cells and Hydrogen Joint Undertaking Past, Present and Future



<http://www.fch-ju.eu/>

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1. The FCH 2 JU
2. The RCS strategy: coordination and implementation
3. Examples of project achievements

Policy framework



Sustainable development

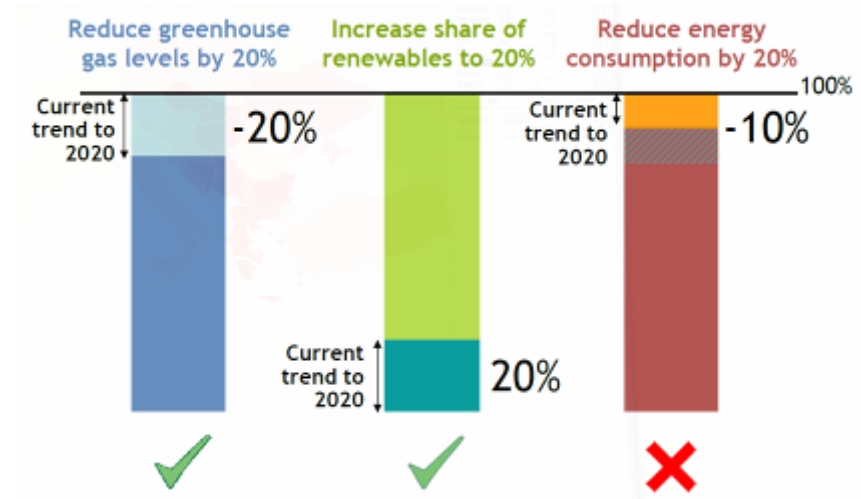


Security of supply

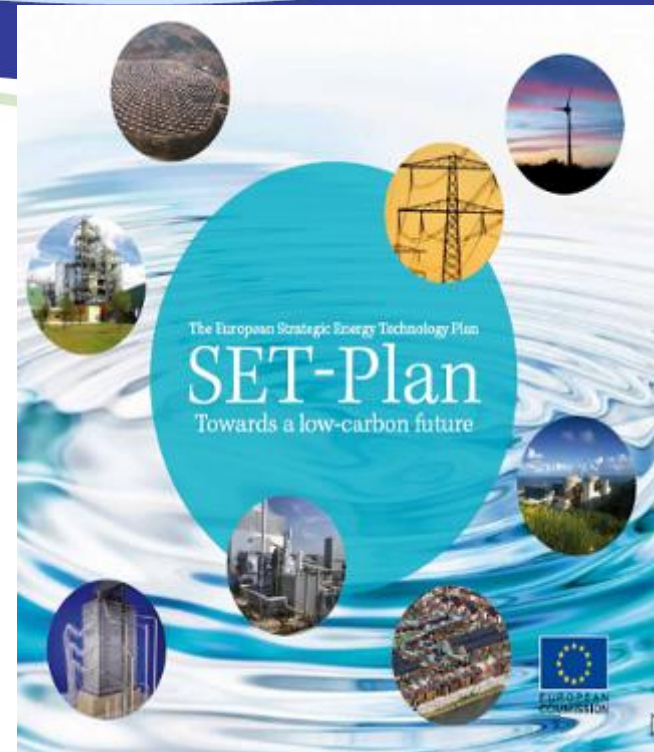
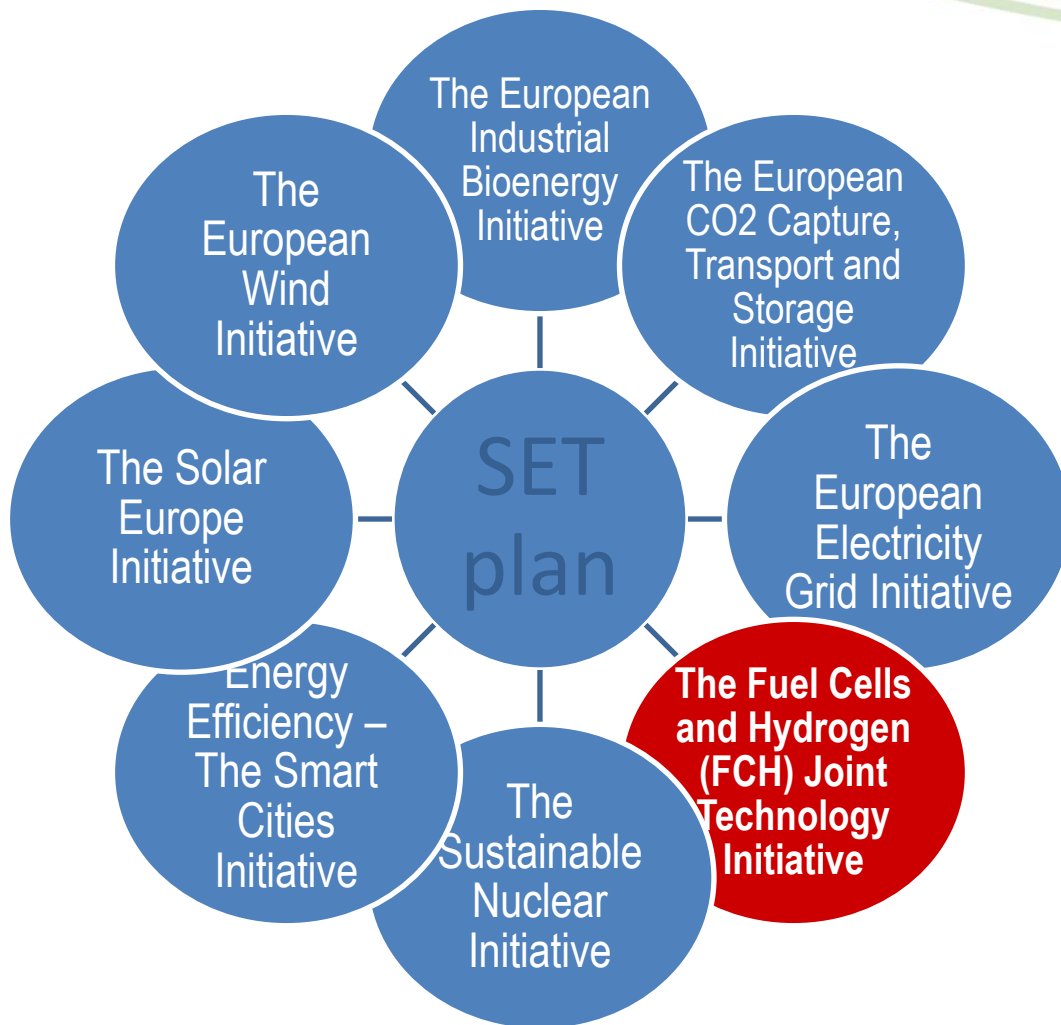
Competitiveness

The 20-20-20 goals by 2020:

- 20% increase in renewables
- 20% increase in efficiency
- 20% decrease in GHG emissions



The European Strategic Energy Technology-Plan (SET-Plan)



**Joint Technology Initiative →
Joint Undertaking**

Council Regulations:
521/2008 of 30 May 2008 and
1183/2011 of 14 November 2011

The Fuel Cells and Hydrogen Joint Undertaking (FCH JU)



Industry Grouping
Close to 60 members
~ 50% SME



European Union
represented by the
European Commission



Research Grouping
Over 60 members



N.ERGHY Research Grouping – 60 Members



- Public-Private Partnership (**PPP**)
- Under the 7th European Framework Program (7FP)
- From 2008 to 2013
- Total budget 940 M€
- Annual Calls for proposals
- 5 Activity Areas (Transport, Hydrogen production, Stationary power generation, Early markets, Cross-cutting)
- Studies

The Joint Undertaking is managed by a Governing Board composed of representatives of all three partners and led by the Industry.

- Council Decision of May 2014
- Total budget of **1330 M€**
- Duration 2014-2020
- 2 Pillars: **Energy and Transport + Cross-cutting**
- Annual Calls for Proposals
- Studies (Procurements)
- More Innovation Projects (60% of the Budget)
- Increased Cooperation with National and Regional Initiatives
- **Official Launch Event: 9 July 2014 in Brussels**

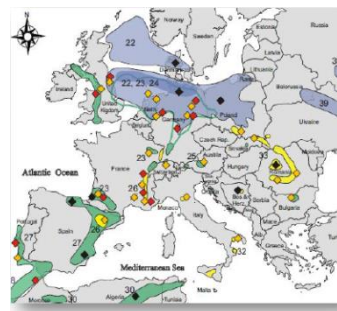
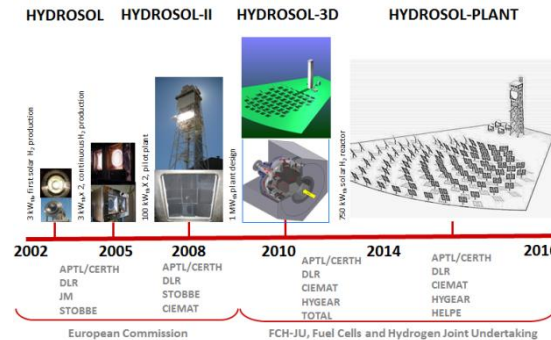
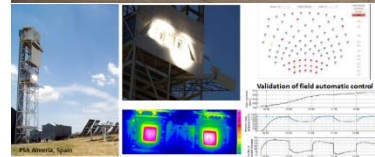
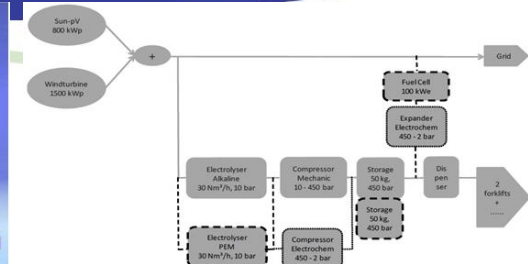
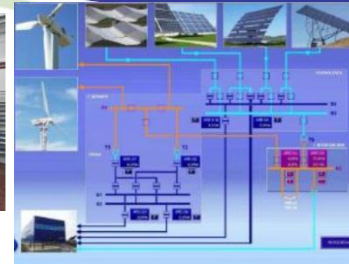
Fuel Cell and Hydrogen Joint Undertaking

155 funded projects

TRANSPORT	38 projects/451M€ Demo: 16*+ 2**+1*** R&D: 18* + 1**	      
ENERGY	90 projects/444M€ Demo: 22*+5** R&D: 51*+10**+2***	   
CROSS-CUTTING	27 projects/55M€ (16* + 10** + 1***)	   

* ongoing
 ** finished
 *** under negotiation

To increase the European energy security of supply (2)



Source: KBB

Storage potential in salt formations



Storage potential in depleted gas fields and aquifers

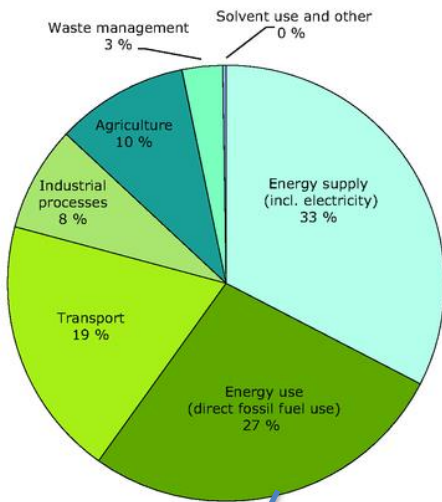


Source: DEEP Underground Engineering GmbH

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



To reduce European energy consumption by 20%



ene.field★

SOFT-PACT

FCpoweredRBS

fitup

- 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



To increase European industries competitiveness

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 billion)

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)

The Future 2014-2020

Reduction of production costs of long lifetime FC systems to be used in transport applications

Increase of the electrical efficiency and durability of low cost FCs used for power production

Transport

Industrial applications

Residential CHP

Feed to electricity grid

Reduce the use of critical raw materials

Existing natural gas, electricity and transport infrastructures

By-product from Chemical Industry

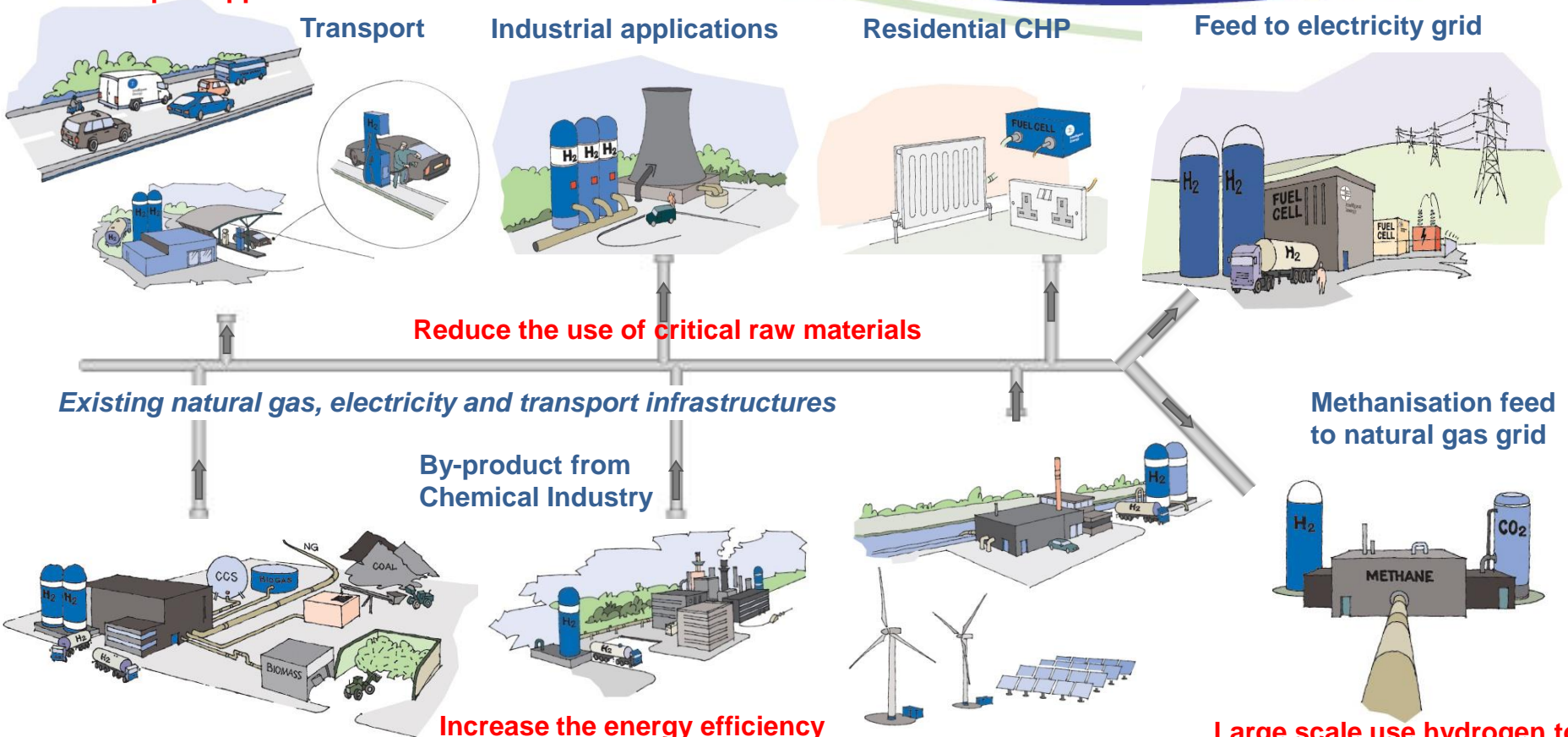
Methanisation feed to natural gas grid

Natural gas, biogas, coal, biomass

Increase the energy efficiency of low cost production of hydrogen from water electrolysis and renewable sources

Renewable generation, storage and 'buffering'

Large scale use hydrogen to support integration of renewable energy sources into the energy systems





2. The RCS strategy of the FCH 2 JU

2. The RCS strategy coordination



From the Multiannual Work Plan

Cross-cutting activities

Safety:

"This is of paramount for public acceptance of FCH technologies, for provision of health and safety, as well as safeguarding property, and special attention will be paid to the technology transfer from the professional community to the general public..

...

Emphasis will be on technical safety, including, but not limited, to pre-normative research.

...

Actions may include technology projects on safety, development of best practice guidelines, development of data bases of incidents/accidents for use in education and training, and development of intervention techniques for first responders at an incident/accident scene."

2. The RCS strategy coordination

From the multiannual Work Plan

The analysis:

"...in the road transportation sector, key areas of technical standardization remain to be agreed to by the industry and regulators.



The gap:

"...but there is no platform to define and express the needs and strategy of the whole European FCH sector."

The answer:

"The FCH 2 JU will tackle RCS issues through the **Cross-cutting activities**. **An industry led RCS Group**, composed of NEW-IG and N.ERGHY representatives will be created. ...the RCS Group will define a strategy in consultation with all European stakeholders and will take the necessary actions to implement it ..."

the JRC will assist the RCS Group and the PO in their RCS tasks

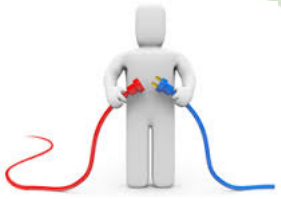
2. The RCS strategy coordination

From the Multiannual Work Plan

In general, the RCS Group will coordinate the following FCH 2 JU activities on RCS and PNR:

- Follow RCS developments, and update and prioritize RCS needs of the sector through a continuous global watch function;
- **Tailor PNR** activities in the FCH 2 JU programme to ensure that safety issues and needs for standardization and regulation are appropriately addressed and validated.
- **Collect and evaluate RCS-relevant information from demonstration projects; monitor PNR activities.**
- Maintain, consolidate and disseminate results of RCS and PNR activities

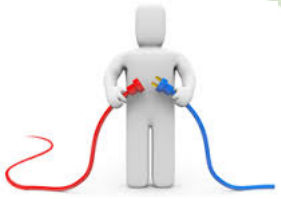
2. Strategy implementation (2014)



Safety in confined environment:

- ☞ Topic FCH-04.3-2014: **Pre-normative research on vented deflagrations in containers and enclosures for hydrogen energy applications**
- ☞ 1.5 M€
- ☞ Scope: Conduct pre-normative research on hydrogen-air vented deflagrations in real-scale containers to prepare an International Standard on “hydrogen explosion venting mitigation systems”

2. Strategy implementation (2014)



Annual Work Plan 2014 –

Topic on Safety in confined environment:

"...**the European standard EN 14994 “Gas explosion venting protective systems” has a very limited range of applicability** and can hardly be used for vent sizing of hydrogen-air deflagrations. Despite more recent hydrogen-air vented deflagration experiments available in the safety community, only few data are representative of real-life conditions that can be encountered in hydrogen-energy containers or enclosures."

*"**Another knowledge gap is the structural response of containers exposed to a vented explosion.** The overpressure – impulse (P-I) diagram has to be modelled theoretically. Mechanical response experiments should also be performed to check the model and its assumptions."*



2. Projects related to safety

ACRONYM	H ₂ CHAIN/TYPE	SHORT DESCRIPTION
HYPACTOR	H ₂ storage	Pre-normative research on resistance to mechanical impact of composite overwrapped pressure vessels.
FireComp	H ₂ storage	Improve the understanding of the conditions to avoid composite cylinders bursting in case of fire. Contribution to updated RCS.
HyFacts**	H ₂ distribution and refuelling stations	Development of training packages and publicly available information materials on public safety experts and regulators on use of H ₂ as energy carrier under real conditions.
MATHRYCE	H ₂ distribution and refuelling stations	Pre-normative research for metallic components exposed to H ₂ -enhanced fatigue (brittleness).
H2Sense	H ₂ conversion and FC systems	Development of cost-effective and reliable sensors for use of H₂.
STACKTEST	H ₂ conversion and FC systems	Development of PEMFC reference test procedures for industry.
HyIndoor	H ₂ conversion and FC systems	Pre-normative research for safe indoor use of FCH systems by sizing natural forced ventilation systems, and sizing of the vent area for deflagration mitigation.
Hyresponse	H ₂ conversion and FC systems	Promote training on state-of-the-art knowledge in hydrogen safety, mock-up real scale hydrogen and fuel cell installations, and innovative virtual reality training.
SUSANA	Tools/databases	Improve guidelines, procedures, databases and tools for the use of CFD for inherently safer design of FCH systems and facilities in Europe.
H2Trust	Tools/databases	Assess the efforts for ensuring that FCH technology is safe and by systematically mapping of safety issues, safety due diligence and best practices.
HYACINTH	Tools/databases	Study the social acceptance of H₂ technologies across Europe, understand barriers and challenges, and develop communication strategies for FCH technologies.

** finished

Source: B. de Colvenaer, Aix-en-Provence 03/09/2014

3. An example of project achievements



Development of H₂ Safety Expert Groups and due diligence tools for public awareness and trust in H₂ technologies and applications

3. Example of project achievements



Specific Objectives of H₂TRUST:

- **Assess industry** efforts to assure FCH technology is safe, adequate regulation, hazard awareness, incident readiness, and ability to respond to public concerns.
- Hazard & **risk assessment** in FCH industry in each of the main application areas.
- **Systematically map safety issues and assess how they are addressed.**
- Compile information demonstrating safety due diligence and **best practices.**
- **Make recommendations for further safety efforts by FCH community.**
- Develop **communications network** to manage public reaction to incidents and give documented responses.
- **Disseminate** the results creating a culture of safety practices.

3. Example of project achievements



H₂TRUST recommendations:

1. Creation of a **statistical mass** of projects/**data** and structured information at European level
2. Enforce crisis management activities specifically dedicated to address safety aspects and with the aim of increasing the level of acceptance
3. Increase the funding of large demo projects (in scale and numbers), which will generate **field experience on safe operations**
4. Wherever possible, foster H₂ use to implement and enlarge industrial symbiosis could help to structure small grids at local level and prepare for further deployment of a future H₂ grid.
5. Improving the refuelling infrastructure to the several hundred numbers of points around Europe



Thank you for your attention !

Further info :

- FCH JU : <http://fch-ju.eu>
- NEW-IG : <http://www.new-ig.eu>
- N.ERGHY : <http://www.nerghy.eu>