

HYDROGEN AND FUEL CELLS IN EUROPE

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THE ENERGY UNION

(EUROPEAN COMMISSION COMMUNICATION FEB.2015)



"I want to reform and reorganise Europe's energy policy in a new European Energy Union."

Jean-Claude Juncker
(President European Commission)

The 5 Pillars of the Energy Union:

1. Security of supply
2. Integrated European energy market
3. Energy efficiency
4. Decarbonisation
5. **Research and Innovation => SET-Plan**

Strategic Energy Technology Plan

HYDROGEN IS PART OF THE ENERGY TRANSITION IN EUROPE: HORIZON 2020

Sustainable
Development



Security of
Supply

Competitiveness

To
The EU targets by 2030*

- 27% renewable energy
- 27% improvement of energy efficiency
- 40% reduction in GHG emissions

**European Council conclusions of 23/10/2014*



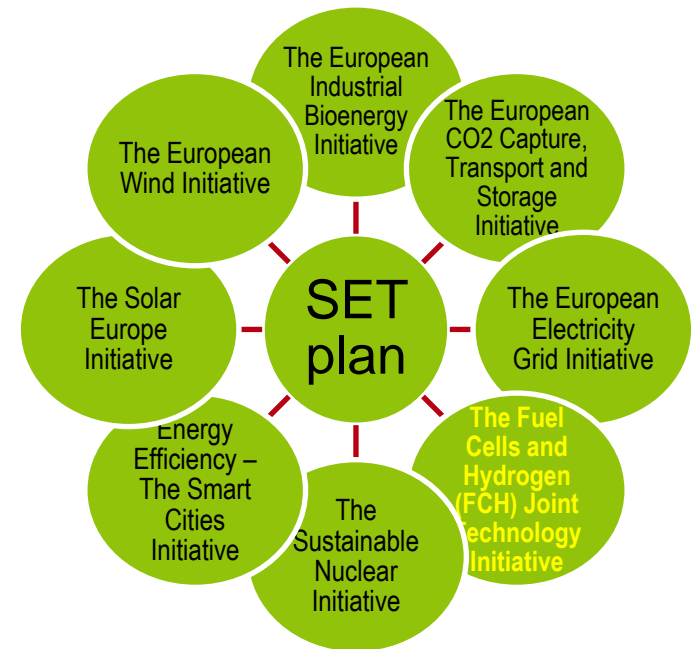
From

The 20-20-20 goals by 2020

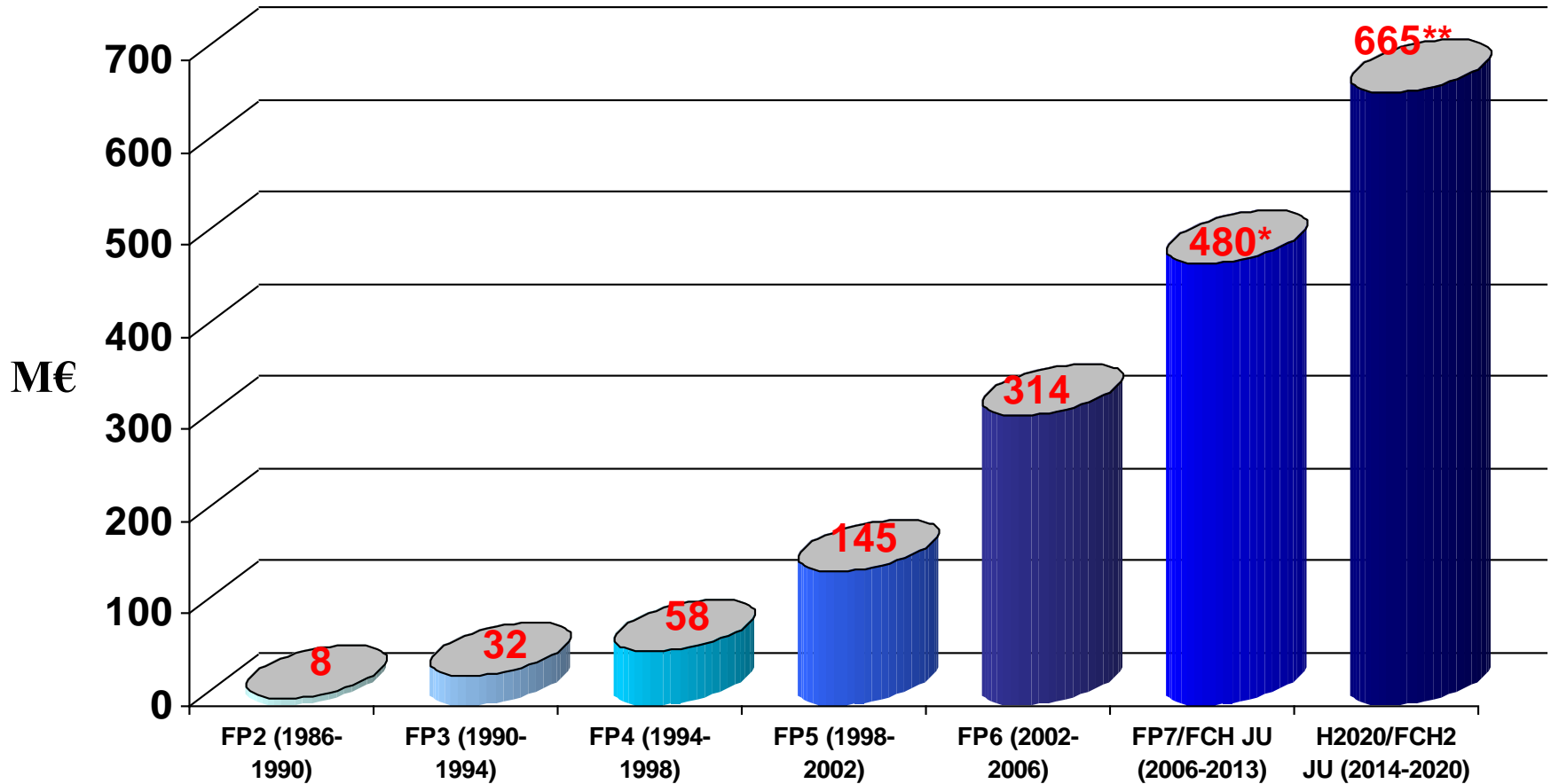
- 20% increase in renewables
- 20% increase in efficiency
- 20% decrease in GHG emissions



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



CONTINUOUS SUPPORT IN THE EU FRAMEWORK PROGRAMMES



** 470 mill EUR implemented by FCH JU + about 10 mill EUR already spent from EU 2007 budget, before FCH JU in place*

*** 665 mill EUR only to be implemented by the FCH2 JU + additional budget from EU programmes for low TRL (basic research) and structural funds/smart specialisation*

FCH2-JU IS A STRONG PUBLIC-PRIVATE PARTNERSHIP WITH A FOCUSED OBJECTIVE

Fuel Cells & Hydrogen Joint Undertaking (FCH2 JU)



Industry Grouping
Close to 100 members
~ 50% SME



Research Grouping
Over 60 members



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



To accelerate the development of technology base towards **market deployment** of FCH technologies from 2015 onwards

Legal basis:

Council Regulations:

- 521/2008 of 30 May 2008 (FP7)
- & amendment 1183/2011 of 14 Nov 2011
- 559/2014 of 6 May 2014 (H2020)

FCH2 JU OBJECTIVES

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

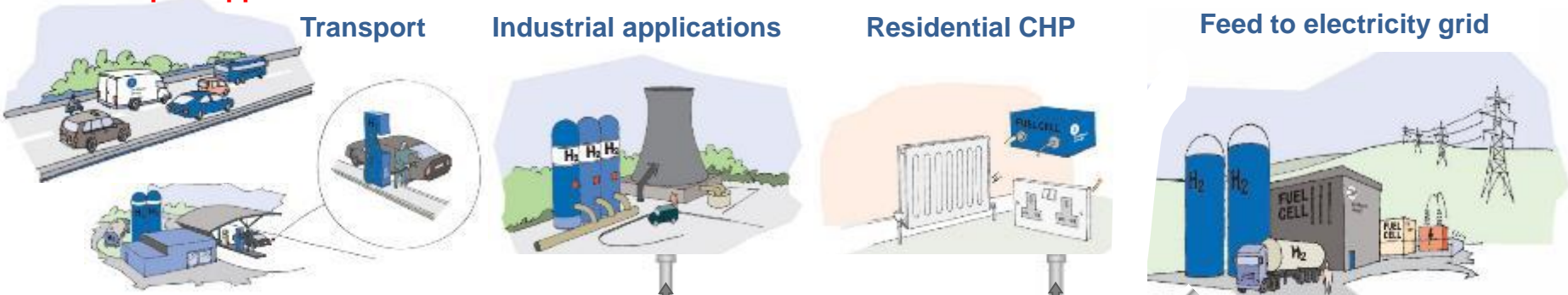
Increase of the electrical efficiency and durability of low cost FCs used for power production

Transport

Industrial applications

Residential CHP

Feed to electricity grid

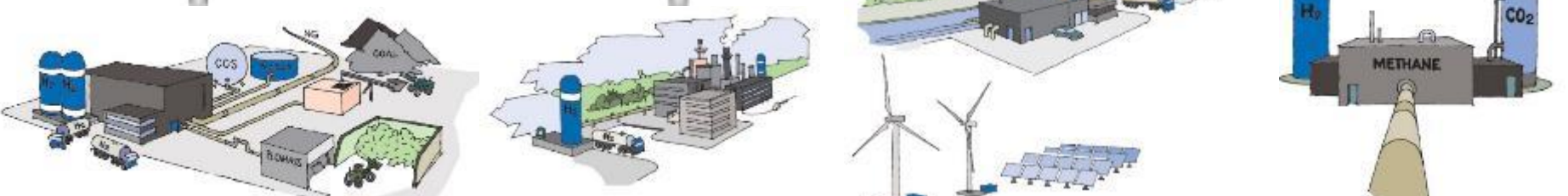


Reduce the use of critical raw materials

Existing natural gas, electricity and transport infrastructures

By-product from Chemical Industry

Methanisation feed to natural gas grid



Natural gas, biogas, coal, biomass

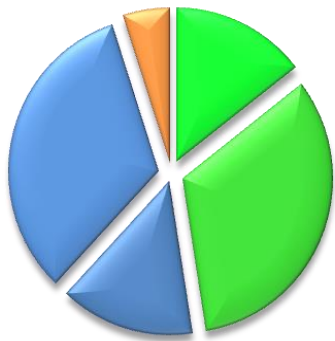
Increase the energy efficiency of low cost production of hydrogen from water electrolysis and renewable sources

Renewable generation, storage and 'buffering'

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

MULTI-ANNUAL WORK PLAN, MAWP (2014-2020)

Joint Undertaking: a powerful financing source



- Transports Systems R&I
- Transports Systems I
- Energy Systems R&I
- Energy Systems I
- Cross-cutting activities

Estimated budget of €1.4 billion

Strong industry commitment to contribute inside the programme + through additional investment outside, supporting joint objectives.

TRANSPORT

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

ENERGY

- Hydrogen production and distribution
- Hydrogen storage for renewable energy integration
- Fuel cells for power and combined heat & power generation

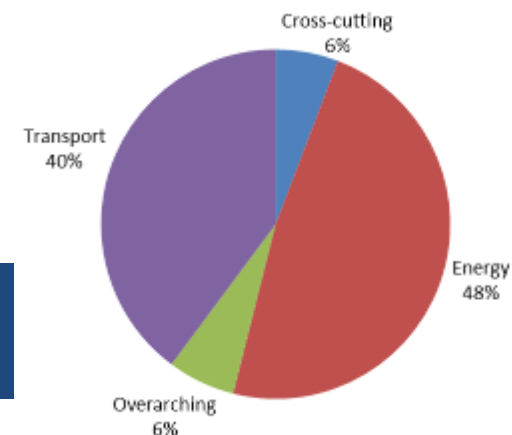
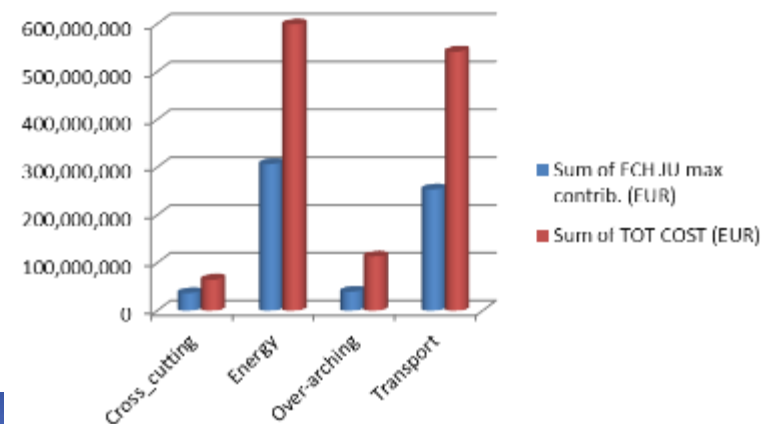
Cross-cutting Issues

(e.g. standards, consumer awareness, manufacturing methods, ...)

FCH2 JU PORTFOLIO OF PROJECTS

185 projects supported for about 638 mill €

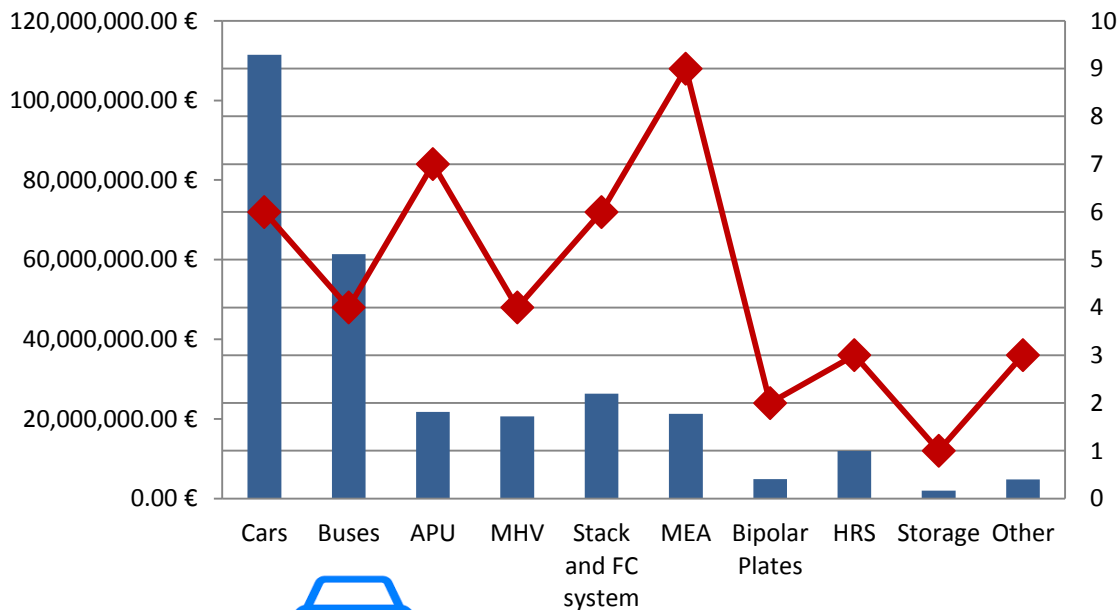
50/50 distribution between Energy and Transport pillars



Similar leverage of private funding: 682 mill €

Continuous/constant annual support (through annual calls for proposals)

TRANSPORT PORTFOLIO



Total FCH JU support:

- 286.6M€ for 45 projects of which 215.3M€ for demos (incl. 21.8M€ APUs)



- Total of 1,785 passenger cars in 6 projects
 - Of which 1,123 with FCs as range extender
- Total of 62 refuelling stations



- Total of 67 buses from 4 projects in 12 locations



CARS: ACHIEVEMENTS AND CHALLENGES

111M€ for 1,785 vehicles from 6 projects with 62 stations

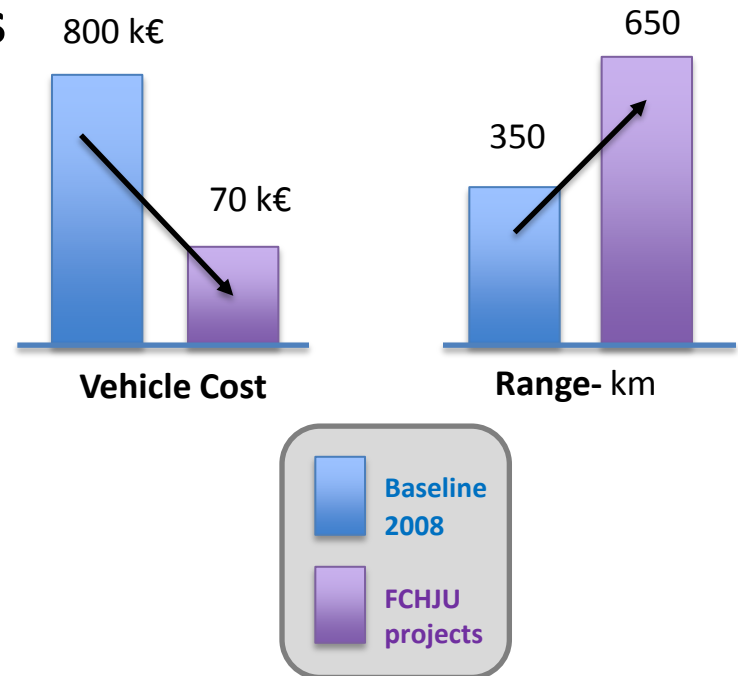
Contributions of FCH JU demo projects

Achievements

- Product ready for commercialization
 - Cold start solved
 - Refilling time solved
 - Range equivalent to incumbent technology
 - High availability
- Cost reduction
- New concepts

Challenges

- Infrastructure:
 - Availability
- Vehicles:
 - Few choices in the market
 - Cost

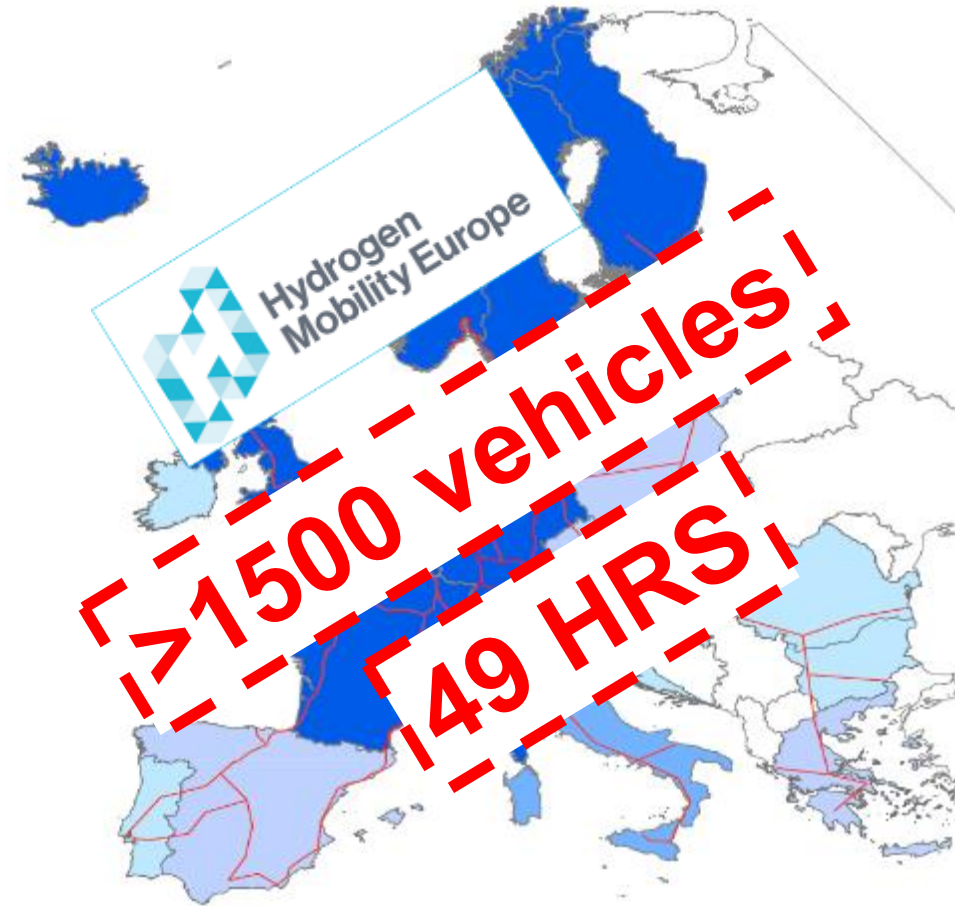


Large validation projects
Increase HRS usage
New models expected

CARS: FROM MEMBER STATES PLANS TO A EUROPEAN PERSPECTIVE

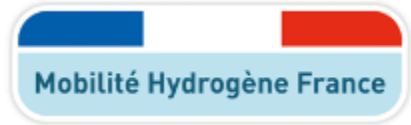
Advanced FCEV and HRS programs

- **France** – H2Mobility project has agreed a strategy based on a transition from captive fleets to nationwide infrastructure for FCEVs.
- **Germany** –
 - 50 H2 stations by end of 2015 under the Clean Energy Partnership. Government and industry invest jointly over 40 M€.
 - the H2Mobility project has already signed a “term sheet” linking six industrial players to deploy 100 stations by 2017 and 400 by 2023 for 350 M€.
- **Scandinavia** – An initial network provides coverage for FCEVs, which can be purchased at equivalent ownership cost.
- **UK** – a consortium with significant Government presence has agreed a strategy based on seeding a national network of 65 stations by 2020. 7.5M€ have been committed by the Government for 15 HRS by 2015.



Similar initiatives are starting or running in other countries: **Austria, Belgium, Finland, Netherlands, Switzerland.**

DEPLOYMENT OF FCEVs AND HRS IN FRANCE



 12 HRS already in operation (5 private)

 3 HRS financed by the FCH2-JU 2014 call, open 2016-2017

 9 HRS financed by the FCH2-JU 2015 call, open 2017-2020

 15 HRS financed by DG MOVE TEN-T in Normandie, open 2016-2018:

- Area = Basse Normandie + Neighborhood
- Principle = prefigure a dense network of HRS at regional scale

 Other territories involved in H2 Mobility projects



+100 FCEVs in operation at May 16



MHVS AND APUS

MHVs

Status:

- 20.7M€ in 4 projects
- Two large demonstration sites
- First 100% greenfield FC site
- 113 units deployed
- Generating the business case

Results:

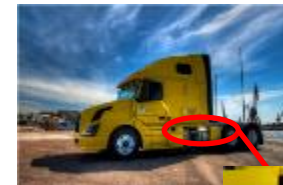
- >22,000 refuellings
- >5,500kg delivered
- >112,000hrs of FC operation
- >90% reliability



APUs

Status:

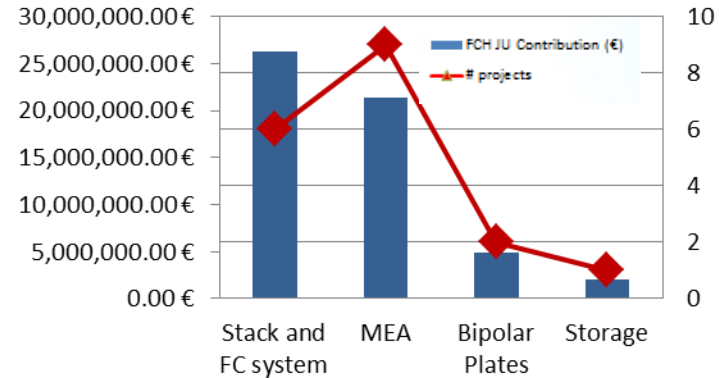
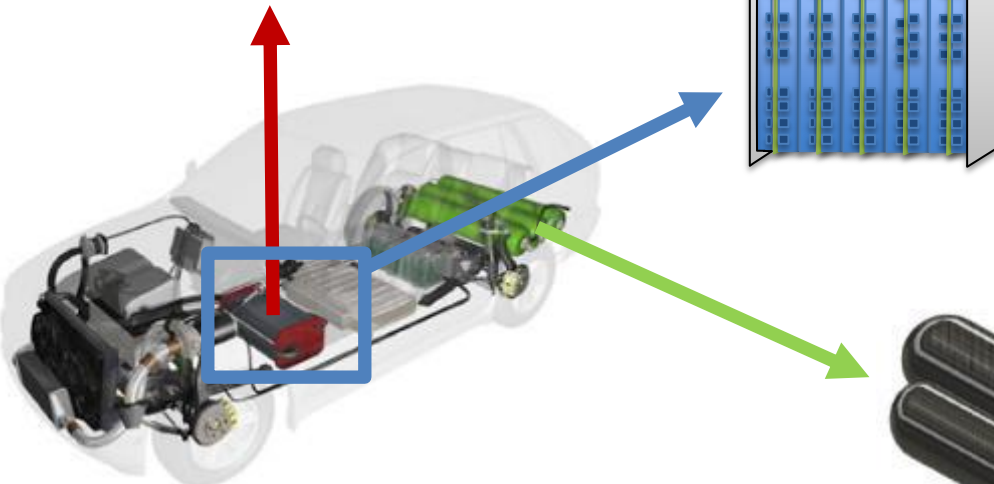
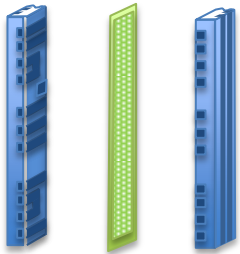
- 21.8M€ in 7 projects
- Variety of APU applications: trucks, maritime, recreational, air
- Prototypes evaluated
- Technical challenges remain
- Business models to be proven
- Each application deals with different technical/business challenges



FCH JU RESEARCH & DEVELOPMENT

FC Components (26M€/11 projects)

- Membranes: +25% in performance
- GDL: +12% in performance & 7% cost savings
- BPP: Improved corrosion coatings; stable >6,000hrs



54.6M€ for 18 projects

FC Stacks (26M€/6 projects)

- Good performance in gen 1 (2.8kW/l)
- Expect SoA 3.6kW/l in gen 2
- Cost: <50€/kW @30,000units/yr

H2 Storage (2M€/1 project)

- +22% gravimetric density
- -55% cost savings

CONCLUSIONS

- **Hydrogen and Fuel Cells are part of the European energy transition**
- **Continuously increasing support in the EU Framework Programmes (FCH2-JU: 665M€)**
- **A strong Public-Private Partnership with a focused objective to accelerate the development of technology base towards market deployment of FCH technologies**
- **Achievements of FCH JU demo and R&D projects**
 - Products ready for commercialization
 - Cost reduction
 - New concepts

THANK YOU FOR YOUR ATTENTION !

Further information



- FCH2 JU : <http://www.fch.europa.eu/>



- HYDROGEN EUROPE : www.hydrogeneurope.eu



- N.ERGHY : <http://www.nerghy.eu>

Thanks to Bart Biebuyck, Executive Director of FCH 2 JU for his kind contribution