Fuel Cells and Hydrogen
Joint Undertaking

New Energy World JU
fuel cells & hydrogen for sustainability

Accelerating market entry of fuel cells and hydrogen technologies

About us

The Fuel Cells and Hydrogen Joint Undertaking (FCH JU) is a unique Public Private Partnership, established on 14 October 2008 for a first period up to 31 December 2017, as the first illustration of a public-private instrument under the European Strategic Energy Technology Plan (SET-Plan), technology pillar of the EU's energy and climate policy.

What we do

The Fuel Cells and Hydrogen Joint Undertaking aims to define and implement an integrated industry driven RD&D programme carried out by and in cooperation with its stakeholders: industry including SMEs, research centres and universities, together with the Member States and European regions and municipalities.

Membership and Structure

The founding members of the FCH Joint Undertaking, which is the body set up to implement the Joint Technology Initiative, are the **European Union** (represented by the European Commission); the **Industry Grouping NEW-IG**, a not-for profit organisation which brings together more than 60 industrial key players in the field and the **Research Grouping N.ERGHY** representing more than 60 research organisations, universities and research centres. The latter two members are open to any private legal entity sharing the objectives of the FCH JU.

Budget

A ring fenced operational budget – nearly € 1 billion, jointly contributed 50/50 by public and private partners – over a 6-year timetable (2008-2013), allows industry to make long term investment plans. The budget is operated to launch annual competitive calls for proposals, which are open to any organisation able to contribute to the research, development and demonstration of the theme in question. The activities are guided by a long term strategy document, the multi-annual implementation plan, which outlines the scope and details the planning.

Fuel cells and hydrogen joint undertaking 2008 – 2013

Catalyst for sector growth

The FCH JU programme has served as a key growth catalyst for the Fuel Cells and Hydrogen sector in Europe. In addition to creating a "hub" of leading major Fuel Cells and Hydrogen players across the innovation chain, it has facilitated access to new opportunities and business partners by:

The FCH JU has united the various stakeholders in the sector and provided programming and financing predictability. This long-term outlook offers a stable environment for activities which otherwise would have been impossible in difficult economic times.

In situations where individual players cannot or will not be the frontrunner in taking initiative, the FCH JU can. It has provided frameworks for impactful coalition studies (e.g. EU power-train 2011, bus 2012) and links between national H2Mobility initiatives.

The FCH JU has played a leading role in actively shaping the priority R&D agenda (e.g. Annual and Multi-Annual Implementation Plans), focusing on the most critical actions, within and across sectors and applications, and assigning funding based on Return on Investment (ROI) criteria.

The FCH JU has funded a broad range of research projects. FCH JU support has enabled many technology breakthroughs and helped smaller companies thrive by being involved in this research.

As a result, the sector has grown substantially since the FCH JU's inception in 2008. A 2012 study "Trends in investments, jobs and turnover in the Fuel cells and Hydrogen sector" reports the following:

10%	8%	6%	6%	16%
average increase in annual turnover (€0.5 billion in 2012)	average increase of R&D expenditures (€1.8 billion in 2012)	average increase of market deployment expenditures (€0.6 billion in 2012)	growth in jobs per year (~4,000 FTE in 2012) while on average the EU job market has contracted	annual increase in patents granted in the EU to European companies (average 1.5% for all European industries)

How about SMEs?

The current FCH JU programme has provided a strong and stable growth platform for SMEs, who are considered valued partners in the FCH JU community. The SME participation rate in FCH JU projects is 25.6%, higher than the FP7 average of 18%. In addition, SMEs are very active players in the system. One seat on the Board of Industry Grouping as well as one seat in the FCH JU Governing Board is specifically reserved for SMEs.

Significant project portfolio

The first generation of the FCH JU programme has achieved substantial progress in both energy and transport applications. The focus of these projects ranges from fundamental/basic research to large-scale demonstration and policy and pre-market studies:

- More than 130 concrete projects have already been supported and additional projects are under negotiation.
- More than 430 individual beneficiaries have participated in the programme since 2008.
- Between 2008 and 2012, a total amount of €391 million was spent on FCH JU activities. Private enterprises received two-thirds of the funding (€258M, of which €100M for SMEs), while research centres and universities received one-third (€133M).

Key figures

Transport:

- 49 FCH buses, 37 passenger cars and 95 mini cars with range extenders will be brought into operation.
- Reduction in H2 consumption : bus 22 =>11 kg/100 km.
- 13 new refuelling stations in EU.
- H2 cost < 10 €/kg.

Stationary Energy Production:

- More than 1000 micro-CHP (Combined Heat & Power generators), mainly for domestic applications .
- Techno-economic achievements: electrical efficiency will be up to 60% for SOFC and below 20,000 €/kW by the end of the trial.

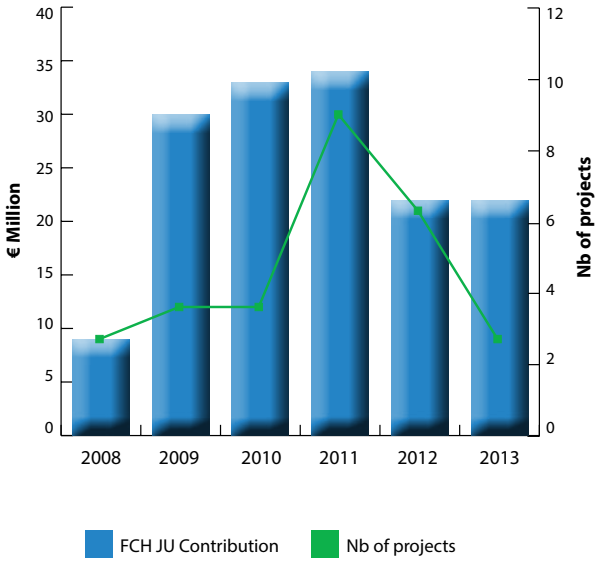
Early Markets:

- 9 fork lifts and 1 tow truck demonstrated
- 19 back up power units installed

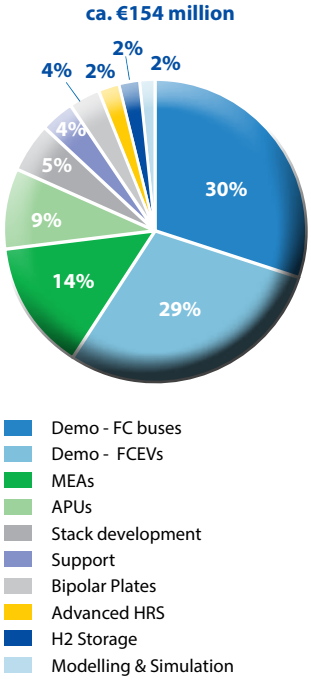
Detailed information regarding all FCH JU projects, as well as results of annual project reviews, is available on the FCH JU website**: www.fch-ju.eu**

Transportation & Refuelling Infrastructure

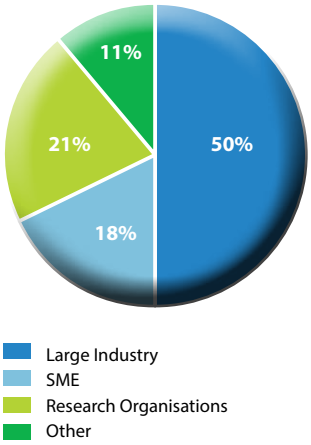
Annual FCH JU contribution and number of projects



FCH JU breakdown budget per type of activity



FCH JU breakdown budget per type of beneficiary



Main Objectives

The main objective of this application area is the development and testing of competitive hydrogen-fuelled road vehicles, the corresponding hydrogen refuelling infrastructure and the full range of supporting elements for market deployment. Additional, the area aims to increase industrial capacity.

The main emphasis is on large-scale, Europe-wide fleet demonstration of next generation fuel cell hybrid vehicles, including cars and buses, hydrogen-fuelled vehicles and an appropriate number of refuelling stations. This measure should demonstrate the durability, robustness, reliability, efficiency and sustainability of both vehicles and infrastructures for everyday use by the general public.

Research and technological development addresses mainly mechanically and thermally stable and long-life membranes; electrochemically stable and low-cost catalysts for MEAs; corrosion resistant and low-weight, volume and cost bipolar plates; methodology and tools for reliable life-time assessments; alternative concepts and improved architectures for efficient and robust peripheral fuel cell system components.

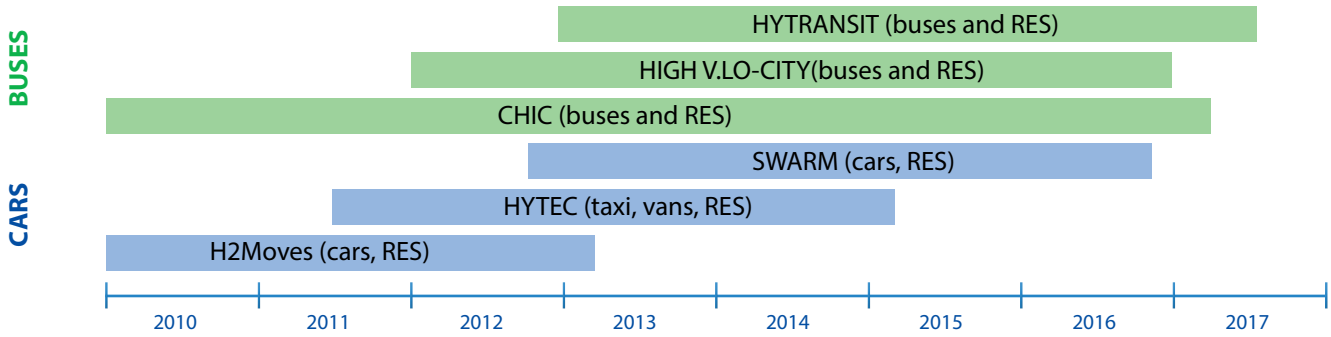
Concerning the hydrogen refuelling infrastructure, this application area foresees the development and integration of the necessary components for hydrogen refuelling stations and their associated peripheral conditioning systems, to further improve energy efficiency, robustness, functionality and safety at a component and system level.

Pre-normative research complements the RTD in this application area. In particular, the following issues are addressed: hydrogen quality requirements and standards; design and test criteria for high pressure composite and solid state storage tanks; fast refuelling protocols and standards; crash tests for hydrogen powered vehicles and safety of hydrogen vehicles especially in confined spaces.

Key achievements

The first key results of the projects in this application area show progress made so far:

- 49 FCH buses, 37 passenger cars and 95 mini cars with range extenders will be brought into operation.
- 13 new refuelling stations will serve the fleet of cars and buses and show an availability of 98%.
- H2 cost < 10 €/kg.
- Reduction in H2 consumption in buses from 22 to less than 11 kg/100 km.
- Co-funding with MS (DK, NO).



H2moves.eu

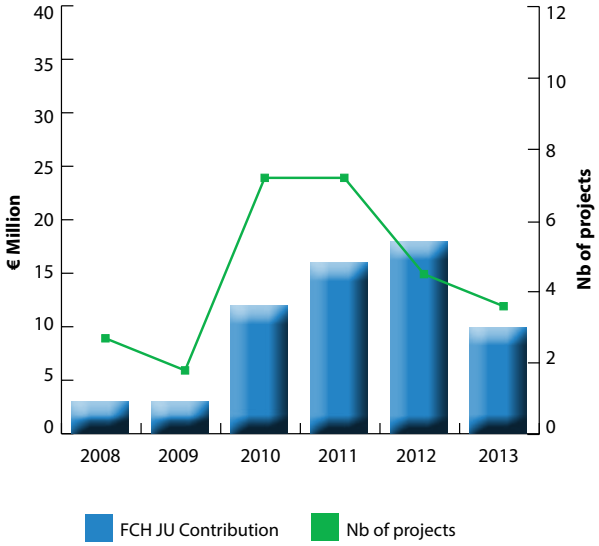
- This project showcases the reliability and hence market preparedness of hydrogen operated fuel cell cars under daily driving conditions, even in harsher climate conditions common to Oslo and Copenhagen.
- The most outstanding result is that the hardware of fuel cell vehicles and the hydrogen refuelling stations (a stationary one in Oslo – Gaustad and a mobile one for use in the European Road Tour) have proven to be extremely reliable.

CHIC

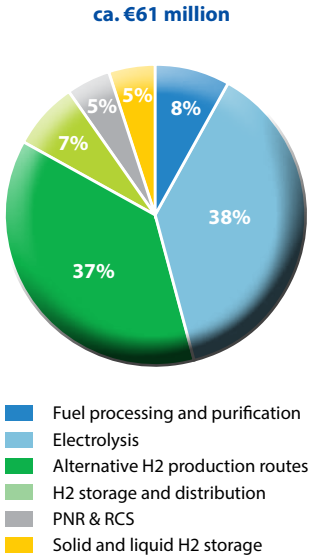
- This project brings together 25 partners from industry, cities and consultant companies who will operate **26 fuel cell buses** in 5 cities across Europe (**Aargau, Bolzano, London, Milano, Oslo**) and the respective hydrogen-refuelling infrastructure for a period of 5 years.
- Transfer of learning to the 5 cities from with existing experience in operating buses and infrastructure (Hamburg, Berlin, Cologne, Whistler; ~ 30 fuel cell buses).
- Assessment of the technology with a focus on environment, economy and society.
- Dissemination to the general public and to cities preparing for the technology in the next step.
- 2 filling stations per city.
- Demonstration phase 2010-2016.
- **Cost: 82 M€, 26 M€ funding.**

Hydrogen Production and Distribution

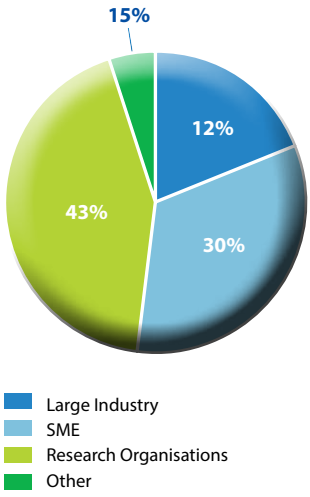
Annual FCH JU contribution and number of projects



FCH JU breakdown budget per type of activity



FCH JU breakdown budget per type of beneficiary



Main Objectives

This application area aims to develop a portfolio of cost-competitive, energy efficient and sustainable hydrogen production, storage and distribution processes. These will help demonstrate the role that hydrogen can play as an energy carrier in reaching Europe's key long-term and mid-term energy objectives:

1) Supply up to 50% of the anticipated hydrogen energy demand (expected to come mainly from transport and early market applications) from renewable energy sources by 2020.
2) In 2020, reach the level of technology readiness required for the de-carbonisation of transport by 2050. This target is expected to be achieved using CO2 lean or CO2 free hydrogen and requires a massive expansion of hydrogen production and distribution infrastructure.

The main emphasis of this application area is on (i) research and development of mature production and storage technologies and (ii) breakthrough oriented research of longer term, fully sustainable hydrogen production and supply pathways. The mature production technologies include (i) reforming (and gas purification) based on bio-fuels as well as conventional fuels; (ii) cost-efficient low-temperature electrolysers adapted for the large-scale use of carbon free electricity and (iii) biomass to hydrogen (BTH) thermal conversion. Long-term and breakthrough oriented research will aim at improving the efficiency of technologies for water splitting using high temperature electrolysers as well as thermo-chemical processes based on solar, nuclear or waste heat, and at developing low-temperature, low-cost biological hydrogen (e.g. enzymes for fermentation) and photo-electrochemical processes for direct hydrogen production. A development objective for most decentralised production technologies is to scale-up to cost effective capacity, as well as using more cost efficient and high performance materials (e.g. membranes) to meet the overall cost targets.

Concerning the establishment of a safe, efficient and reliable hydrogen distribution and refueling infrastructure, the main focus is the demonstration of technology options for high volume, safe hydrogen storage such as storage in underground caverns and decentralised storage, in synergy with the energy storage requirements resulting from the variability and intermittency of renewable energy sources connected to the electricity grid. This will be complemented by long-term and breakthrough orientated research on improved hydrogen storage, based on solid and liquid materials, for increased efficiency and storage capabilities. Attention will also be given to improving the means of hydrogen distribution and delivery by road transport (e.g. increased capacity) in order to meet the needs of large fueling stations.

Finally, efforts will need to be dedicated to closing RCS gaps through further pre-normative research on design/installation requirements for novel hydrogen production, storage or distribution technologies (such as large capacity stationary storage or high capacity gaseous hydrogen transport).

Key achievements

- Development of new materials for the removal of asbestos in alkaline electrolysers.
- Development of large scale PEM electrolysers aiming for MW scale commercial units.
- Development of power electronics for connecting intermittent renewable energy sources to electrolysers.
- Electrochemical compression of hydrogen.
- 50% reduction of energy consumption for the liquefaction of hydrogen through up-scaling and optimisation.
- Improved safety for pressurised hydrogen tanks.

ELYGRID

The research project ELYGRID aims to contribute to the reduction of the total cost of hydrogen produced via electrolysis coupled to Renewable Energy Sources (mainly wind turbines) focusing on Mega Watt size electrolysers (from 0.5 MW and up). The objectives of the project are to improve the efficiency related to the complete system by 20% (10% related to the stack, and 10% electrical conversion) and to reduce costs by 25%. These objectives are being achieved through improvements in membranes used in the electrolyser stack (>70% stack efficiency), through new designs and new products of power electronics that match better electrolyser operations when coupled to Renewables. These improvements will be applied to 3.5 MW electrolysers operating at 32bar, exceeding the 2020 targets of MAIP 2007-2013.

Picture of the IHT electrolyser at the FHA facilities

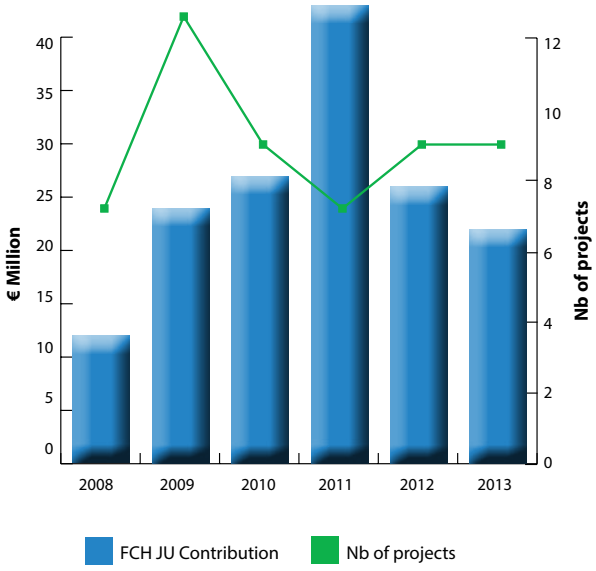
IDEALHY

The research project IDEALHY aims to develop an economically viable hydrogen liquefaction process. The different steps in the liquefaction process have been analysed in detail and through the use of innovations, greater integration and increased capacity (up to 200 tons per day) have been achieved. The specific energy consumption was reduced by 50%, simultaneously reducing investment cost. This was achieved through the choice of a mixed-refrigerant cycle for pre-cooling of the hydrogen from a feed temperature in the range 100–140 K and through the selection of innovative key process components and sub-systems such as compressors, expanders, heat exchangers and catalysts. These led to changes in the process design, resulting in additional reheat and recompression loops for the hydrogen gas. By the end of the project, the net power consumption is expected to be 12.8 MW for 50 t/d liquefaction rate. This corresponds to a specific liquefaction power consumption of 6.15 kWh/kg with a state of the art figure of 12kWh/kg.

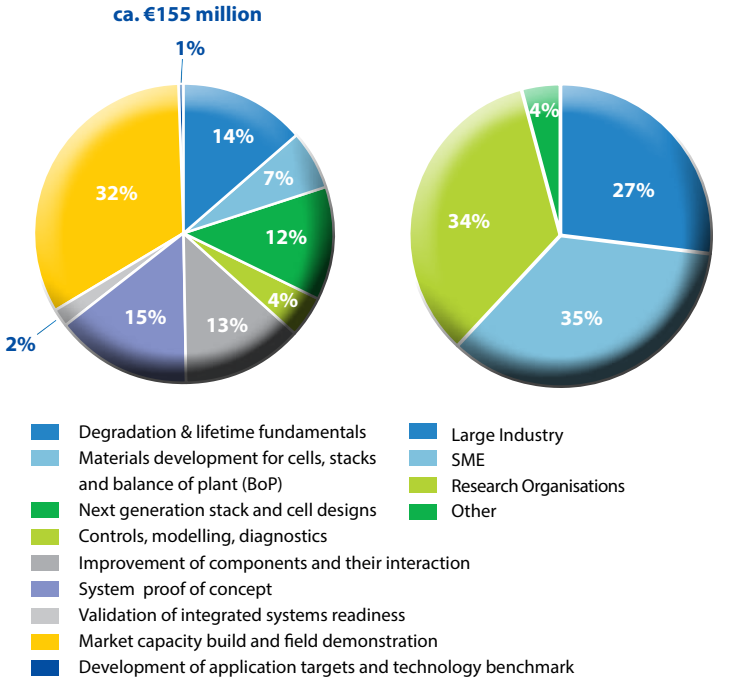
Picture: Storage vessel for liquid hydrogen, Source: Linde

Stationary Power Generation and Combined Heat & Power (CHP)

Annual FCH JU contribution and number of projects



FCH JU breakdown budget per type of activity



FCH JU breakdown budget per type of beneficiary

Main Objectives

The **overall objective** of this Application Area is to improve the technology for fuel cell stack and balance of plant components to the level required by the stationary power generation and CHP markets, by **bridging the gap between laboratory prototypes and pre-commercial systems.**

This includes test campaigns for product validation under real market conditions and preparations for the start-up of fuel cell installation, operation and maintenance services. At the same time, scaling up the European manufacturing capacities will allow for industrial production of fuel cell products. Approximately **34-37% of the overall budget will be devoted to this application area.**

The goal of this application area is to achieve the main technical and economic specifications necessary for stationary fuel cell systems to compete with existing and future energy conversion technologies. For example: electrical efficiencies should be >45% for power only units and >80% for CHP units, combined with lower emissions and use of multiple fuels. In addition, substantial effort is needed to address the lifetime requirements of 40,000 hours for cell and stack, as well as ensuring competitive costs for specific types of applications.

Reaching these targets requires deployment of the main fuel cell technologies, in particular PEMFC and SOFC, plus some support from alkaline technology. Although these technologies are all at different stages of maturity and targeting somewhat different market segments, none of them can be successfully deployed commercially at present in competitive markets. Based on this consideration, **the support provided is highly application orientated and technology neutral.**

Similarities exist between the base technology and requirements of the fuel cell technologies in this Application Area and those for on-board power generation (e.g. APU) in the "Transport and Refuelling Infrastructure" Application Area and UPS and back-up power in the "Early Markets" Application Area. Therefore, in order to benefit from the existing synergies, co-ordinated research topics are promoted.

Key achievements

- **More than 1,000 micro-CHP**, mainly for domestic applications (addressing different routes to market).
- Techno-economic achievements: **electrical efficiency will be up to 60% for SOFC and below 20,000 €/kW** by the end of the trial.
- **Research aspects:** cost reduction through new materials and techniques; longer lifetime through understanding of degradation issues; diagnostic and control tools.

Soft-Pact

The research project Soft-Pact plans to demonstrate 100 micro-CHP units (BlueGen, SOFC based, provided by Ceramic Fuel Cell Limited company) in Germany, the United Kingdom, Italy and Benelux. The aim is to reach electrical efficiency of at least 60% and address the most important commercial challenges by developing the whole supply chain, mass manufacturing aspects and European housing stock availability. The project will also address the various certification schemes in Member States, Standard Assessment procedures and Grid connection standards.

So far, more than 30 units have been successfully installed in the UK and Germany and electrical efficiencies of 60% have already been registered.

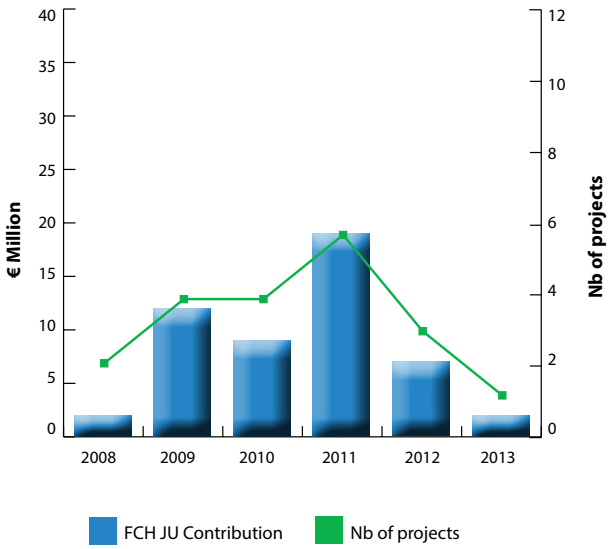
The challenges are mainly to do with the readiness of the market rather than with the technology itself.

Enefield

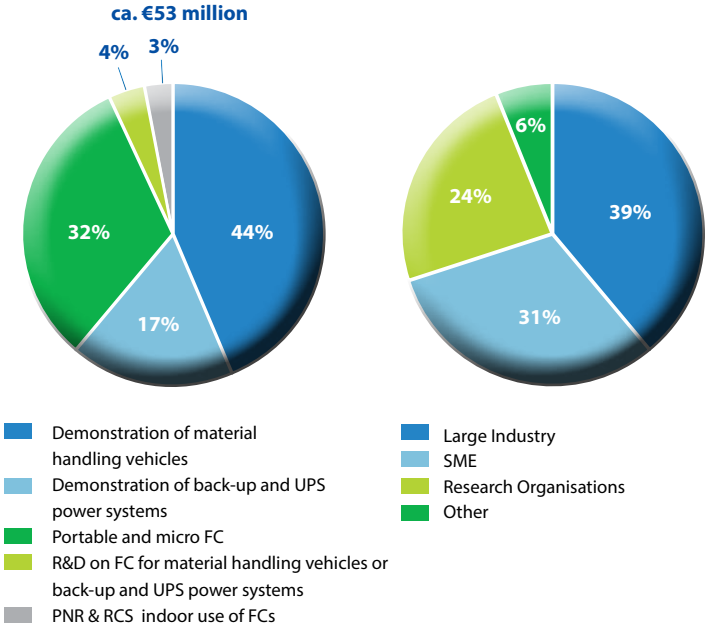
The Enefield Project represents the main demonstrator in Europe and aims to test around 1,000 micro-CHP units from 9 European manufacturers (both PEM and SOFC based). It is supported by 24 utilities across 12 of the EU Member States. The project builds on the experience already gained in the German national project CALLUX, therefore some of the manufacturers will reach the last phase/trial before commercialisation. The project started at the end of 2012 and has already successfully installed the first 2 units.

Early Markets

Annual FCH JU contribution and number of projects



FCH JU breakdown budget per type of activity



FCH JU breakdown budget per type of beneficiary

Main Objectives

Early markets are considered strategically important to build up and sustain an early manufacturing and supply base for fuel cells products and systems. For this reason, this application area aims to develop and deploy a range of fuel cell-based products capable of entering the market in the near term.

The largest share of the budget for this application area focuses on short-term demonstrations and ready-to-market products. The main goal will be to show the technology readiness of (i) portable and micro fuel cells for various applications; (ii) portable generators, back-up power and UPS-systems; (iii) speciality material handling vehicles including related hydrogen-refuelling infrastructure. The common goal for all the demonstrations will be the need to create bases for volume build-up that can help reduce costs and pave the way for a commercial market introduction.

Early market applications will play an important role in gaining operating experience and providing feedback into technical development and manufacturing processes and also demonstrating the technologies to potential users.
Research and technological development will be carried out in parallel with the demonstration areas in order to prepare technologies needed for full commercial use. The main foreseen research focus areas include reducing the cost of the fuel cell system by developing Balance of Plant components, improving efficiency and the lifetime of the fuel cell system and enhancing fuel supply for fuel cell applications.

In many cases, early markets represent niches that are the business domains of SMEs. Support measures will specifically address existing commercialisation risks and regulatory hurdles that impact on the business of such companies. These should result in improved integration of SMEs in the industrial supply chains so that their innovations can more easily be translated into practical products and manufacturing processes.

In order to pave the way for a widespread acceptance of fuel cells in early applications, pre-normative research will aim to develop methodologies and procedures for safe indoor use of fuel cells, including noise, emissions, safety and compatibility with electrical and building codes.

Key achievements

- FCH material handling vehicles such as forklifts, tow trucks and refilling: 9 forklifts, 1 tow truck
- 19 back up power units in Italy, Switzerland and Turkey
- FCH power for Unmanned Aerial Vehicles
- Hybrid systems: battery, FCH, PV, DMFC, micro FC, etc.

Fitup

FITUP is a demonstration project in which final users in Italy, Switzerland and Turkey have installed a total of 19 market-ready fuel cell systems from two different suppliers as backup power sources. Real-world customers from the telecommunications industry are using these fuel cell-based systems on-site, with power levels in the 3-12kW range. These units are being tested to demonstrate a level of technical performance that qualifies them for market entry, thereby accelerating their worldwide commercialisation, in particular:

- Reliability greater than 95%
- Durability of more than 1,500 hours
- More than 1,000 cycles

The project involves the benchmarking and certification of units from both fuel cell suppliers according to a test protocol developed by the consortium. The protocol was developed to conduct extensive tests in field trials in sites selected by the final users. The performance is logged and analysed by research centres to draw conclusions regarding commercial viability and the degree to which customer requirements are meet, as well as suggesting areas for improvement. About 50% of planned tests have already been performed (about 1,300 total hours). Analysis of the data collected so far indicates that the project will meet its targets and will show that the systems developed are competitive with incumbent technologies such as batteries and/or diesel generators.

The project has a 3-year time span and a total cost of 5.4 M€ with a FCH JU contribution of 2.5 M€. The consortium consists of large and small entities including fuel cell system manufacturers, end users, certification companies and R&D centres.

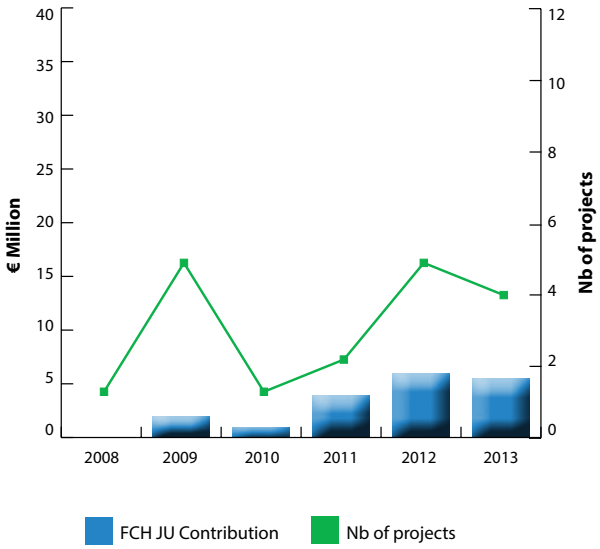
HyLIFT-DEMO

HyLIFT-DEMO and its continuation HyLIFT-EUROPE aim to demonstrate >200 fuel cell material handling vehicles and associated refuelling infrastructure in 10-20 sites across Europe, making it the largest European trial of hydrogen fuel cell material handling vehicles so far and the world's first large scale demonstration of airport tow tractors.

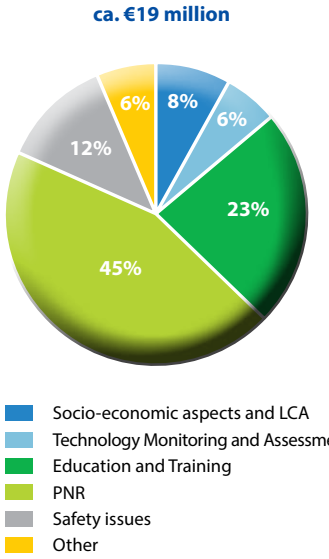
Fuel cell systems will be fully integrated and operated in forklifts and warehouse trucks from Still and airport tow tractors from Mulag. The high volume combined with the FCH JU support is enabling a cost-neutral demonstration operation for vehicle-users. Dialogues have been established with 33 vehicle-users with a combined fleet of 2,097 vehicles of the types targeted for demonstration.
Ten of these vehicles are already running and accumulating data with over 1,500h of operation so far.

Cross-cutting activities

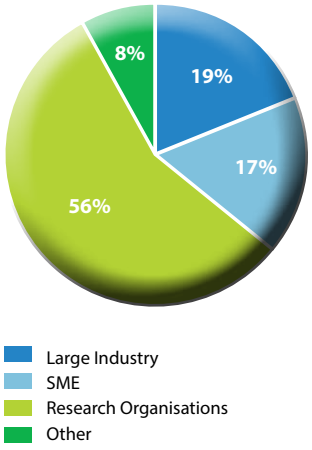
Annual FCH JU contribution and number of projects



FCH JU breakdown budget per type of activity



FCH JU breakdown budget per type of beneficiary



Main Objectives

Cross-cutting activities aim to support and enable the other application areas at programme level. The main goals are to evaluate the socio-economic, environmental and energy impact of FCH technologies, monitor the RTD programme implementation and support the growth of the European industry, particularly SMEs. These activities **mainly include RCS and PNR**; socio-economic research; technology monitoring; sustainability assessment; education and training activities; public awareness; development of financial instruments and logistic support schemes. Approximately **6-8% of the overall FCH JU budget** will be dedicated to these cross-cutting activities.

The setting up of RCS strategy coordination targeting RCS and PNR actions will help European stakeholders to bring their fuel cells and hydrogen products to the market. They will ensure that the **non-technical barriers are addressed** to give Europe a strategic advantage in the global market.

As of FCH JU call 2013, around €19 million has been dedicated to 18 projects focusing mainly on PNR, education and training, safety issues, socio-economic aspects, LCA and TMA.

Key achievements

- The FC-Hyguide project developed common LCA guidance documents applicable for both FC and hydrogen technologies.
- In order to create the human resources base required by a growing industry, educational activities have been undertaken developing education and training prWWogrammes at all levels, covering specific target groups such as regulators (HyFacts), technical project managers (HyProfessionals) and post-graduate engineers and scientists (TrainHy-Prof).
- A specific technology monitoring and assessment tool (TEMONAS) has been tailored for the FCH JU in order to monitor progress towards the FCH JU objectives and vis-à-vis major external developments.

Hyresponse

The objective of HyResponse is to support the successful implementation of FCH demonstration projects and market transformation by providing educational and practical hydrogen safety training to First Responders, who must know how to handle potential incidents to protect the public without risking their own lives. Their understanding can also facilitate local project approval.

The project will:

- Develop and disseminate First Responders hydrogen safety educational materials in Europe.
- Build a European Hydrogen Training Platform with mock-up, real scale transport and hydrogen stationary installations on which full scale operational exercises will be realised.
- Create a virtual reality platform reproducing entire accident scenarios, thereby testing the whole chain of command and communication between all members of the First Responders team.
- Train 50 European First Responders during three training sessions of one week each.
- Disseminate knowledge to the First Responders community via a website providing free access to the teaching materials, an online interactive virtual training programme, the European Emergency Response Guide and links to hydrogen and fuel cells related information.

Hyunder

This project aims to establish a European initiative supporting the large scale deployment of hydrogen energy storage in underground storage caverns. Their storage potential will be bench-marked in relation to the energy market and competing storage technologies. Additionally, the project will identify and assess application areas, stakeholders, safety, regulatory framework and public acceptance.

An analysis of the potential role of H2 underground storage in comparison to other large scale electricity storage technologies (e.g. pumped hydro power, compressed air energy storage) has already been performed, along with an assessment of geological storage options for H2 underground storage. As a result, salt caverns have been identified as the best candidate.

A mapping of geological formations suitable for storing hydrogen in six representative European countries (Spain, France, the UK, the Netherlands, Germany, Bulgaria) has also been carried out, as well as a description of below and above-ground process technologies for H2 underground storage plants and safety-related issues.

FCH 2 JU under HORIZON 2020

Why should the proposed partnership continue?

European leaders have recognised the potential of Fuel Cells and Hydrogen technologies to substantially contribute to Europe's economic growth. For energy security, grid scale energy storage is a strategic imperative for European governments. As a versatile energy carrier, hydrogen can become a key integrating element in the new energy landscape – circumventing the need for an investment-intensive overhaul of the power and energy grid infrastructure across Europe. FCH technologies are key components in the EU's energy and transport policy as well as in maintaining Europe's competitive edge in technical innovation.

The FCH JU programme 2008 – 2013 has achieved significant progress and has contributed to bringing some applications near to market readiness (e.g. material handling, back-up power systems, portable power generation, etc.). However, deployment of applications with the strongest potential to address energy security and climate issues (e.g. road transport, public urban transport, stationary power generation, combined heat and power, hydrogen from renewable energy sources and electricity storage) requires both further technical developments and demonstrations to achieve large scale production volumes fast.

What is the Fuel Cells and Hydrogen 2 Joint Undertaking?

It is the implementation of a new phase of the Fuel Cells and Hydrogen Joint Technology Initiative (JTI). It will continue to develop a portfolio of clean, efficient and affordable fuel cells and hydrogen technologies to the point of market introduction and help secure the future international competitiveness of this strategically important sector in Europe. The new FCH 2 JU is expected to start in 2014 and end in 2024.

What results and benefits do we expect?

Thanks to the concentration of European fuel cells and hydrogen research and innovation under the umbrella of the Joint Undertaking, participants will benefit from: better use of Europe's limited public research funds, a more stable and safer investment climate and better knowledge sharing. In addition, this public private partnership will leverage private investments in the technologies up to at least the same amount as the public funds.

What will be the strategic objectives of the FCH 2 JU?

The proposed renewed programme will build on the experience gained in the period 2008-2013 and will implement a focused innovation programme to develop a portfolio of clean and efficient solutions, to the point of market deployment, that exploit the properties of hydrogen as an energy carrier and fuel cells as energy converters.

The strategic objectives of the renewed programme will be to:

- boost the share of FCH technologies in a sustainable, low-carbon energy and transport system;
- enhance energy security in Europe at affordable prices for end-consumers;
- ensure a world leading, competitive European FCH industry with research excellence leading to industry innovation, growth and jobs.

What will the new total budget be?

The proposed commitment is €1.4 billion. The expected EU contribution will be up to €700 million from the Horizon 2020 programme budget. The private contribution of €700 million will consist of both in-kind contributions in call for proposals activities and of complementary actions implemented in addition to the calls, contributing to the objectives of the initiative.

How will FCH 2 JU be managed?

The FCH 2 JU will continue to be an industry led private-public partnership with the same membership as at present: the Industry Grouping NEW-IG, representing the European FCH industry sector, the Research Grouping N.ERGHY, representing the European FCH research community and the European Union represented by the European Commission. They will jointly establish a multi-annual strategic research, development and demonstration agenda, implemented through projects selected by open and competitive calls for proposals. The selection of the best proposals will be based on independent peer review and concluded by formal funding agreements. A small number of activities will be implemented through calls for tender (i.e. public procurement). The new FCH 2 JU Governing Board will take funding decisions.

How will the programme be structured?

The implementation of the FCH 2 JU programme will be structured around two main innovation pillars, **Transport** and **Energy**, supported by cross-cutting research activities that integrate technologies supporting both the energy and transport sectors such as standards, training and studies.

- FCH Technologies for Transportation Systems: Road transport will be the principal priority as it offers the highest potential for addressing EU climate change and energy security objectives. The programme will address performance improvement and cost reduction of the next generation of fuel cell electric vehicles and development of the necessary hydrogen refuelling infrastructure – both critical points for mass deployment. Non-road mobile vehicles and machinery, maritime, rail and aviation applications will also be included.

- FCH Technologies for Energy Systems: For the energy sector, the FCH 2 JU programme will focus on hydrogen as a "smart link" driving the convergence between energy, industry and mobility markets. Another focus area will be storage of renewable electricity and grid balancing, including hydrogen blending in the natural gas grid. Finally, fuel cells in Power, Combined Heat and Power and Combined Cooling Heat and Power systems for domestic, commercial, municipal and industrial applications plus other small applications will also be included.

When will the new programme start its operations?

The Draft Council Regulation for a Fuel Cells and Hydrogen 2 Joint Undertaking under Horizon 2020 was adopted by the Commission on 10 July 2013 as part of the Innovation Investment Package. The Package is currently being negotiated by the Member States, supported by the opinions of the European Parliament and the European Economic and Social Committee. All players have expressed their interest in coming to a successful conclusion in early 2014 and to start operations, including new calls for proposals, as soon as possible.

Fuel Cells and Hydrogen Joint Undertaking

New Energy World IG
fuel cells & hydrogen for sustainability

Industry Grouping
Over 60 members

European Commission

European Union
represented by the
European Comission

N.ERGHY
research on fuel cells & hydrogen

Research Grouping
Over 60 members