



FCH 2 JU support to Research and Innovation Activities - Call 2015

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Infoday Pilhas de Combustível e Hidrogénio, Lisboa 26 Maio 2015



www.fch-ju.eu

- 1 – Introduction**
- 2 – FCH in FP7/H2020**
- 3 – Project portfolio and achievements**
- 4 – Call 2015 - AWP topics**

European Climate and Energy Policy Framework



From

The 20-20-20 goals by 2020:

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

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

Joint Undertaking – Public Private Partnership

Council Regulations:

521/2008 of 30 May 2008 (FP7)

1183/2011 of 14 November 2011

559/2014 of 6 May 2014 (H2020)

Strong public-private partnership with a focused objective

Fuel Cells & Hydrogen 2 Joint Undertaking



**Industry Grouping
NEW-IG**
87members



European Union
represented by the
European Commission



**Research Grouping
N.ERGHY**
63 members



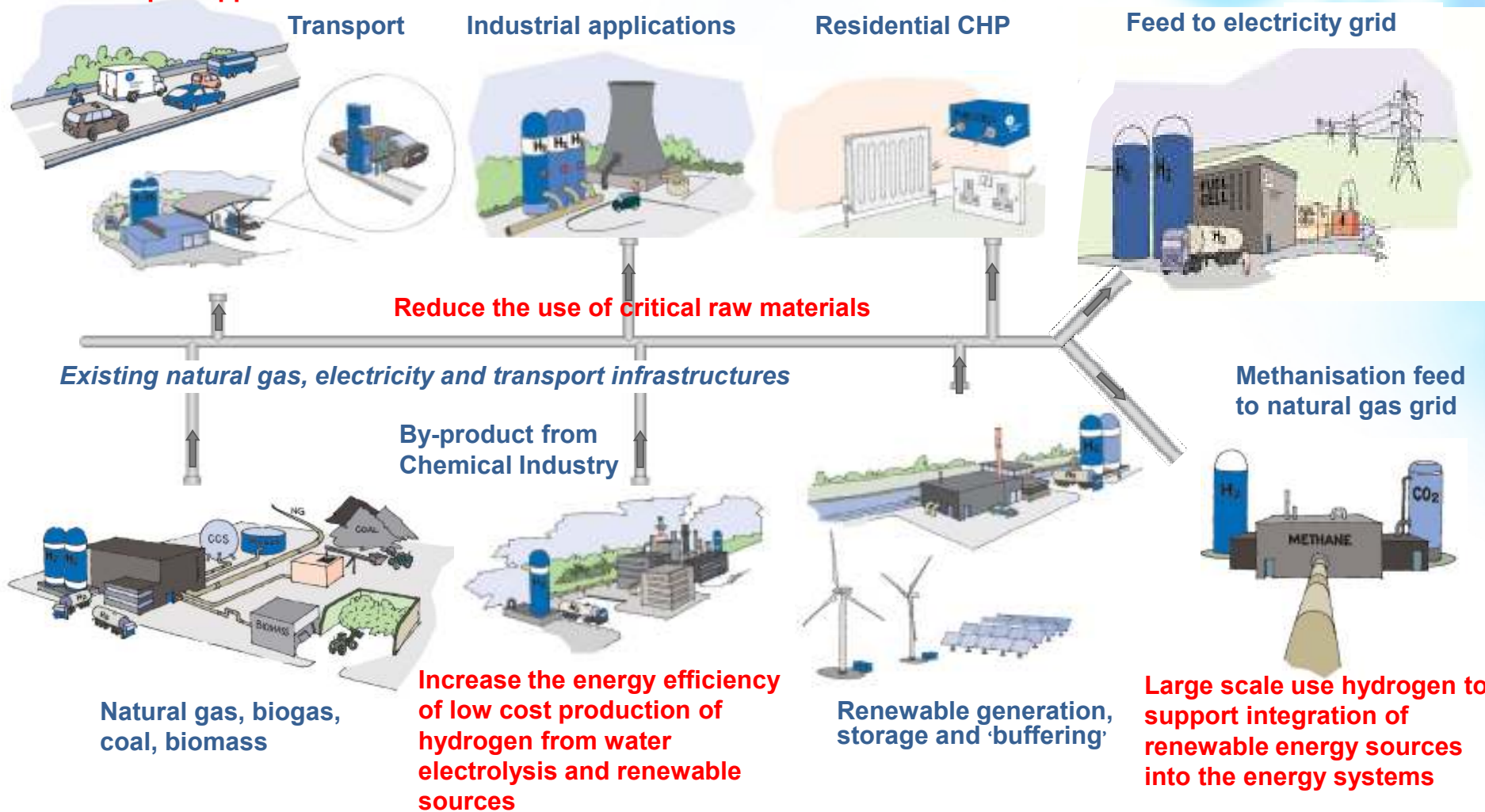
The Joint Undertaking is managed by a **Governing Board** composed of representatives of all three partners and lead by the Industry.

*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 2 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



FCH 2 JU under Horizon 2020

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 combined heat & power generation
- Hydrogen production and distribution
- Hydrogen for renewable energy generation (incl. blending in natural gas grid)

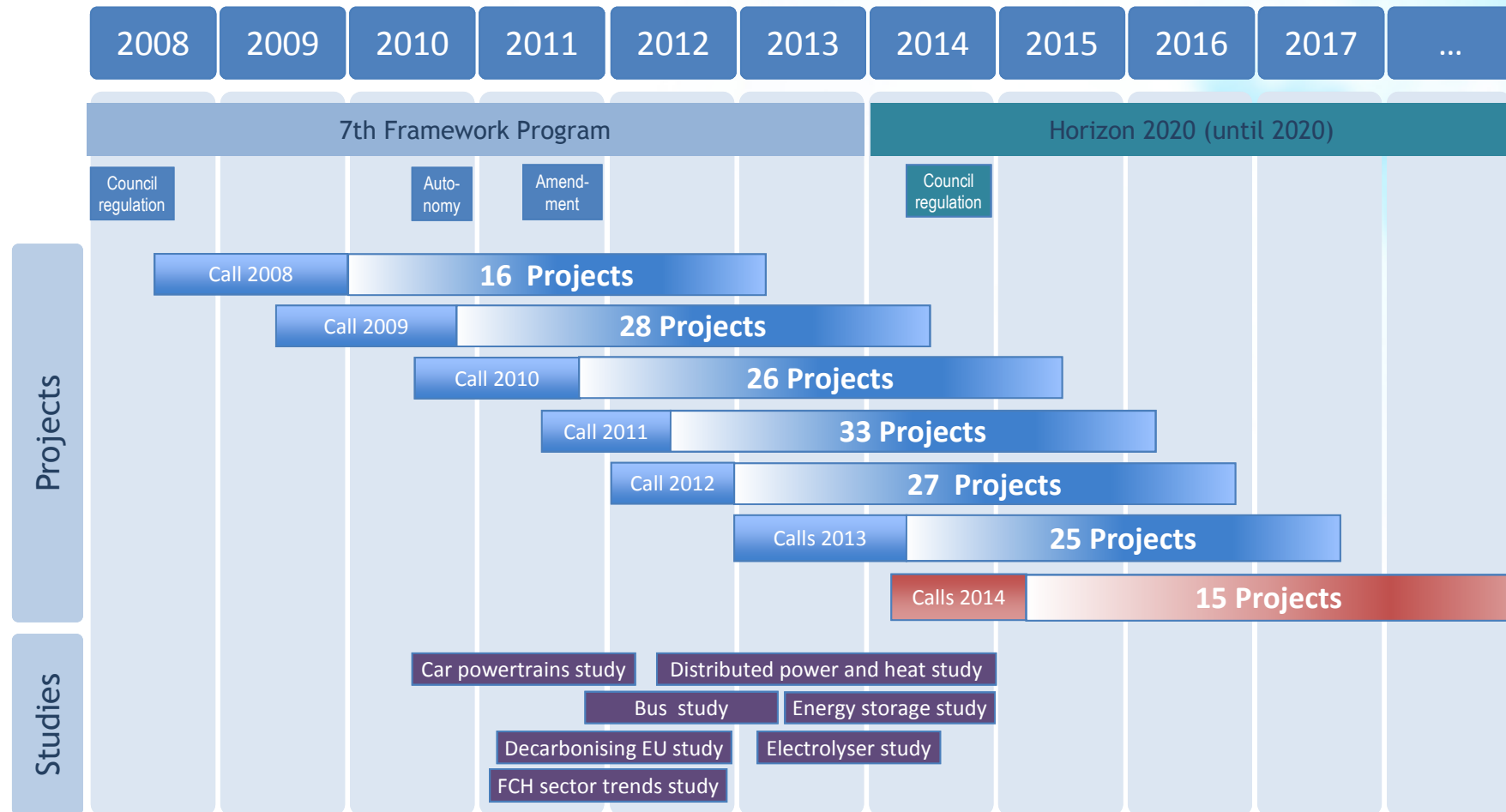
CROSS-CUTTING ISSUES

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

- Members: IG / RG / EC
- PPP structure
- Implementation mainly through calls for proposals or procurement studies
- More demonstration and market uptake (60% of FCH JU contribution)
- In-kind contributions only from members (or constituent entities)
- At least 3 Member States involved in a project (except support action)
- Increased Cooperation with National and Regional Initiatives

Supported activities 2008-2017

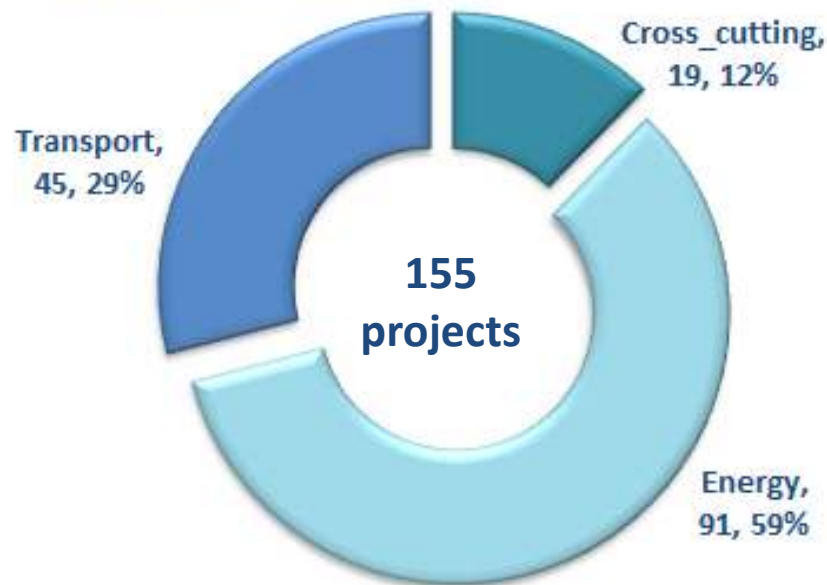
(under 7th Framework Programme of the EU)



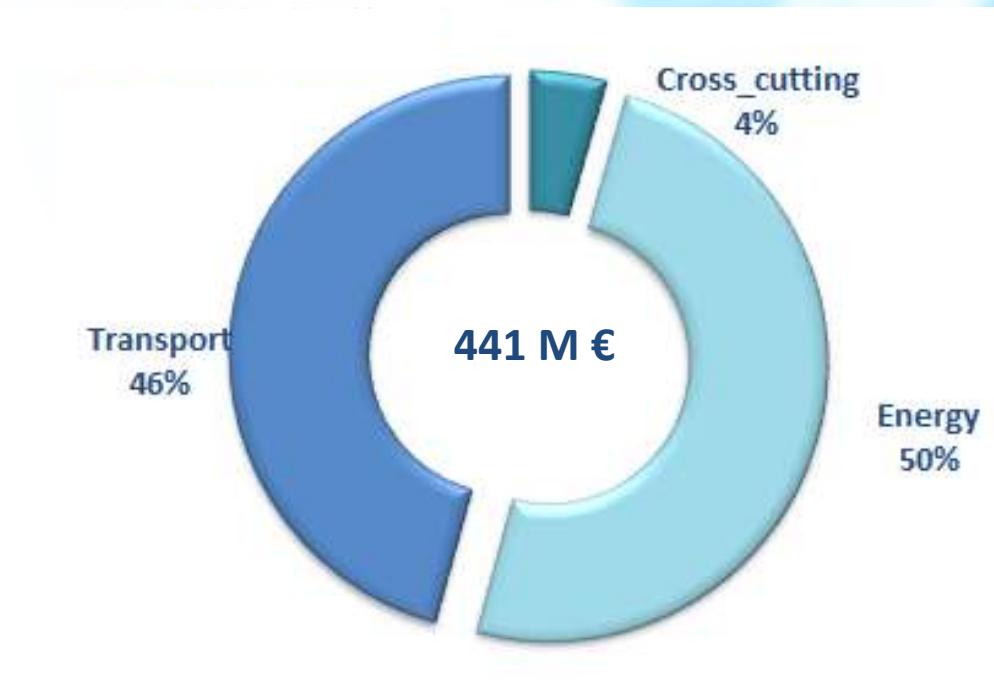
- Total of **155** research and demo projects
- Total value of about **1 bill €** (*incl 450 mill € EU support*)

FCH JU funding in FP7 - overview by application area

By number of projects



By FCH JU contribution (M€)

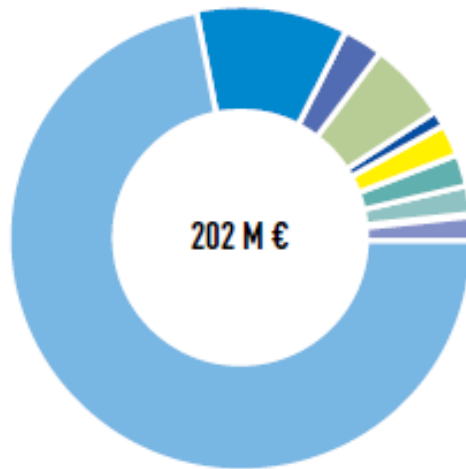


Mature European FCH strategy:

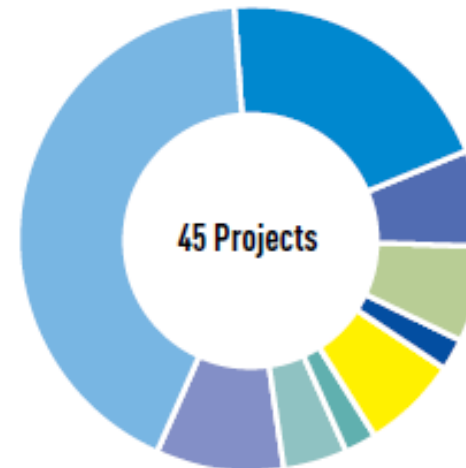
- Strong, visible and coherent
- Consensus strategy (through the multi-annual and annual work-programmes)
- Pre-competitive collaboration

FCH JU Funding in Transport projects (FP7 legacy) – 202 mill EURO

**FCH JU CONTRIBUTION
per project type
2008-2013**

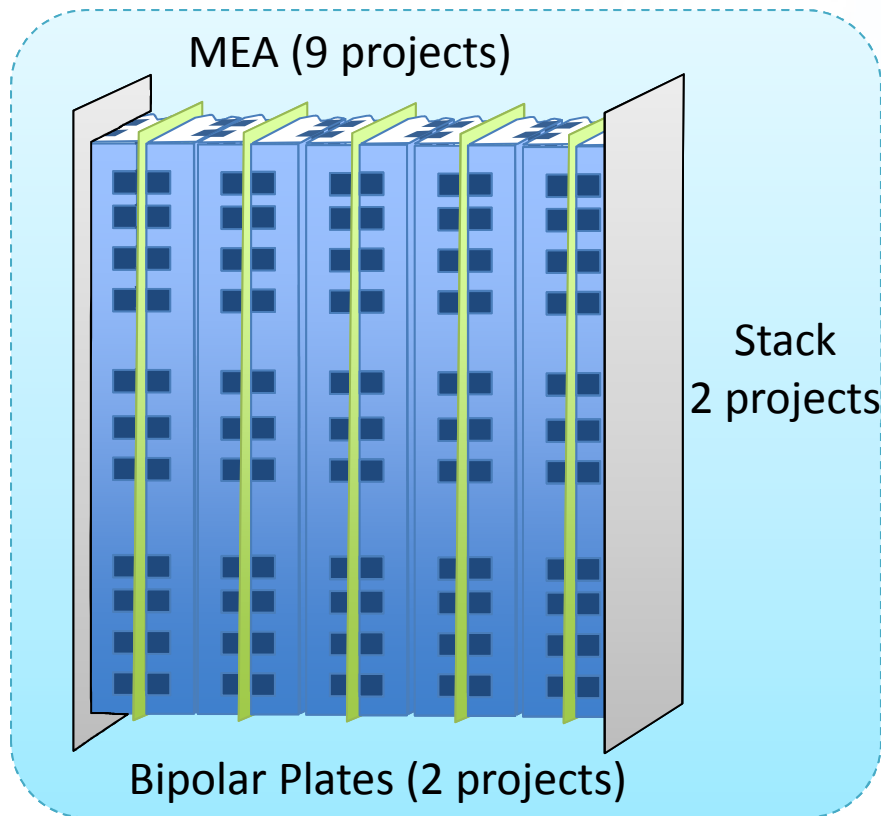


**NO. PROJECTS
per type
2008-2013**



Demonstration & PoC 145 M € - 19 projects	Bipolar Plates 6 M € - 3 projects	Modelling & Simulation 2 M € - 1 project	HRS 4 M € - 1 project	Supporting Actions 3.2 M € - 4 projects
MEA 21 M € - 9 projects	Stack & Subsystems 11 M € - 3 projects	H₂ Storage 5 M € - 3 projects	APU 4 M € - 2 projects	

Transport activities – R&D



H₂ Storage
2 projects

Modelling
1 project



Advanced HRS
1 project

Main conclusions:

- Comprehensive level of MAIP coverage
- Strong focus on FC components (MEA, BP)
- R&D supported mostly in calls 2011 & 2012 (74% of total)
 - Bulk of impact to come 2015+

Transport activities – Demo

-Demonstration of > 260 hydrogen cars

-Installation of > 40 filling points

-Demonstration of > 74 hydrogen buses

-Demonstration of > 400 hydrogen materials handling vehicles

-Demonstration of 4 auxiliary power units for trucks, planes and maritime applications



HyFIVE



HyTransit

3EMotion

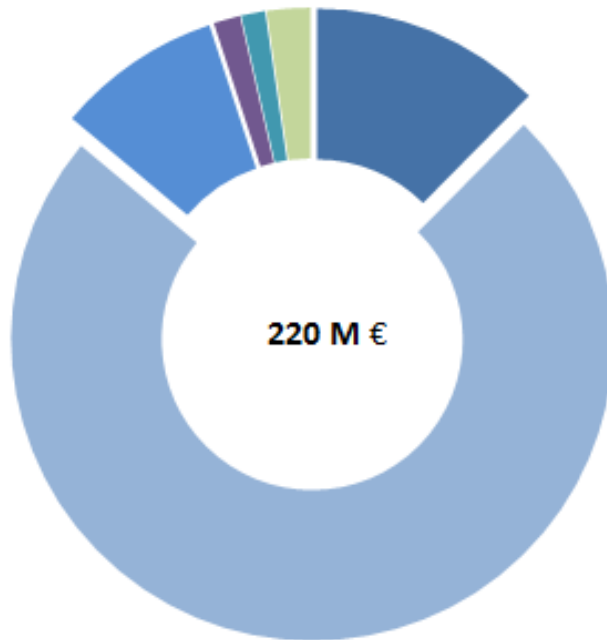


SAPIENS

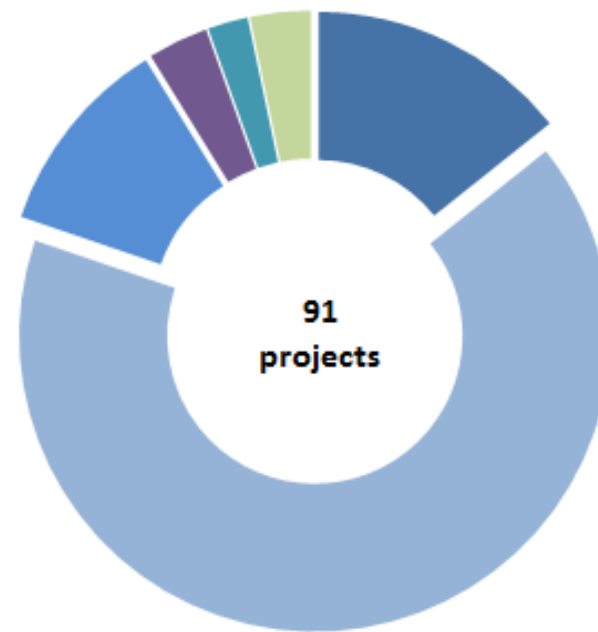








FCH JU Funding in Energy projects (FP7 legacy) – 210 mill EURO

FCH JU Contribution per technology type 2008-2013

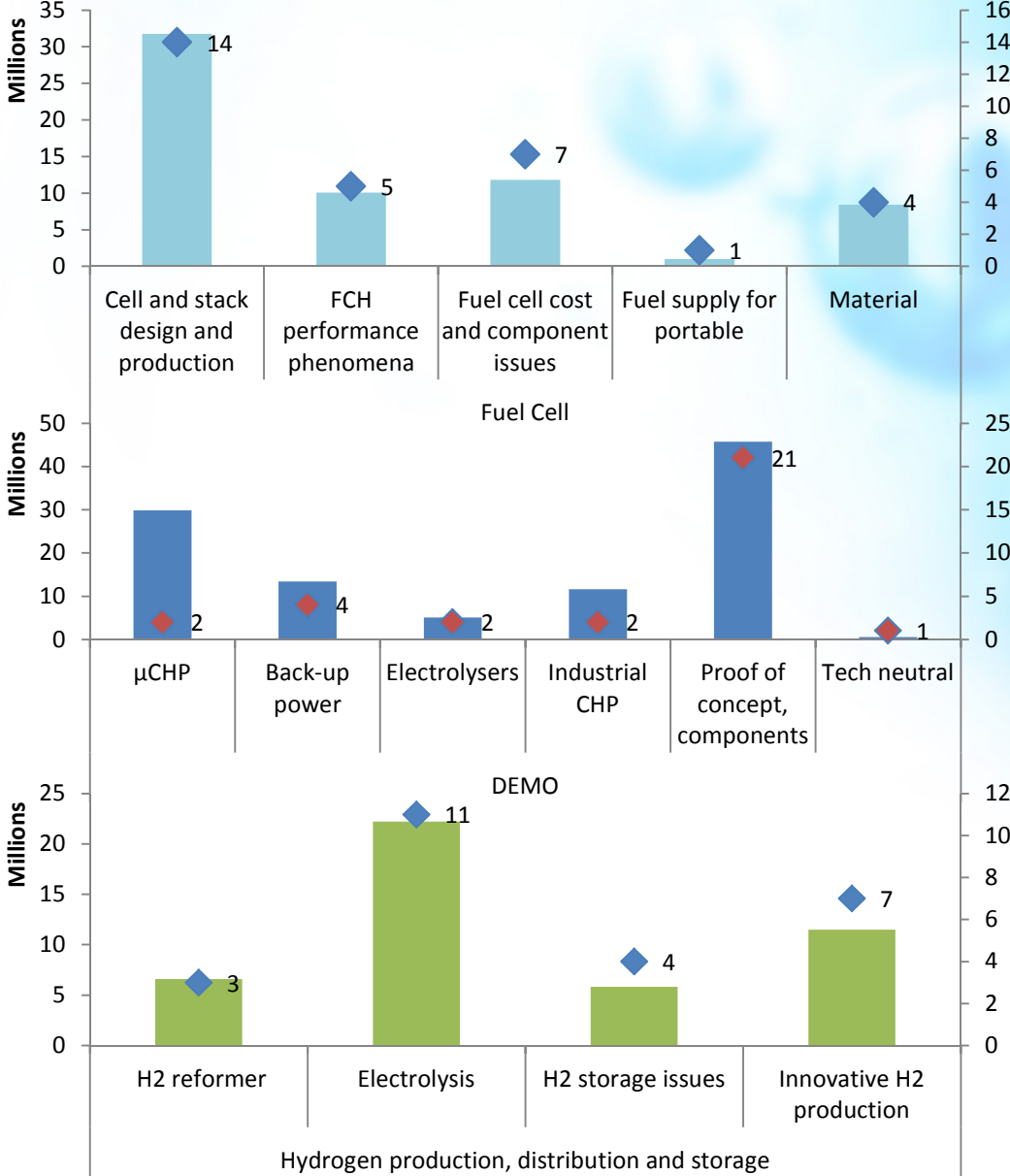
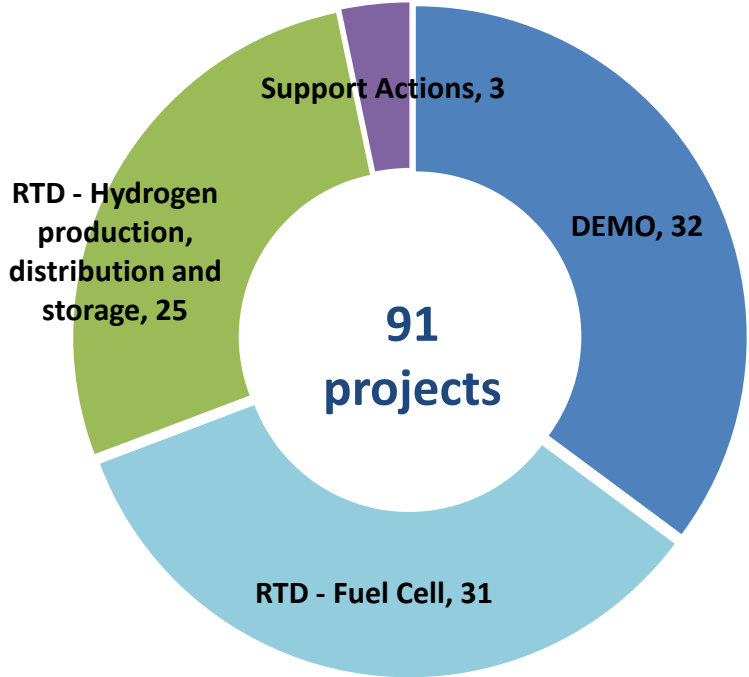


NO. projects per technology type 2008-2013



 Electrolyser 27 M € - 13 projects	 Green H2 production 19.5 M € - 10 projects	 H2 safety 3 M € - 2 projects
 Fuel Cell 162 M € - 60 projects	 H2 distribution 3 M € - 3 projects	 H2 storage 5 M € - 3 projects

Energy projects by project type





DEMO projects overview



SOFT-PACT

ene.field★

CLEARgen™ Demo

POWER-UP

ELYGRID
Research to enable Soft-Pact Efficient Conversion to Remote and Standalone Energy Storage

fitup

FC powered RBS

Research

100 micro-CHP units (1 manufacturer, 4 countries)

1000 micro-CHP units (9 manufacturers, 12 countries)

1 MW industrial CHP unit /PEM based (in Europe – place tbc)

500 kW industrial CHP unit/alkaline based (in Germany)

1 MW alkaline electrolyser (coupled with wind energy, in Spain)

19 back-up and UPS units (3 countries)

18 live Radio stations (off-grid) in Italy



2010

2013

2016



Different climates/technologies/routes-to-market

Increased volumes

Cost reduction/Increased durability

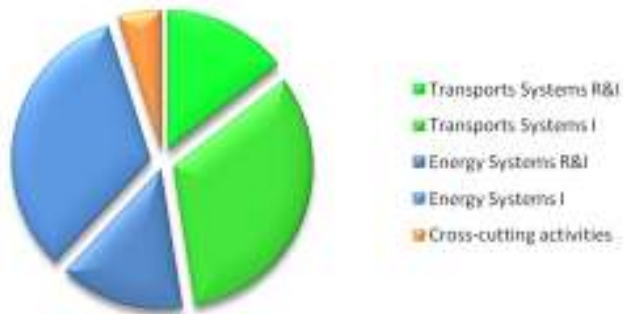
Research

Important achievements in m-CHP early-demonstration

- More than 60 BlueGen units in DE, UK, NL
 - 56% electrical efficiency, 25% reduction of CAPEX
- More than 120 units in DE, FR, CH, IT, DK, AT
 - 10 field trials/manufacturers
 - Commercial discussions on-going (more than other 200 contracts signed and other 200 in final negotiation) – ramping-up of additional 500 units by Sept 2015
 - Electrical efficiency around 35% for PEM units and 45-50% for SOFC units
- *Challenges*
 - *Difficulties for new markets (exception DE where Callux project has already built the acceptance)*
 - *Reduced interest of utilities (mainly electricity), although main route to the market – direct contracts with end-users less suitable for mass-deployment !*
 - *Duration of service contract, sometime longer than life-time of the project – related issue in addressing national/regional funding*
 - *Only approx 1/3 of the end-users/houses contacted meet the required conditions for m-CHP installation*
 - *Small quantity supply chain, need for training of installers etc*

MAWP 2014-2020 Budget distribution

Funding distribution	Research and Innovation		Innovation		Total	
	Value	Percentage	Value	Percentage	Value	Percentage
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 (MEURO)	192	29%	426	66%	646	100%



Budget of €1.33 billion in 2014 - 2020

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

2015 Call for Proposals

- Launch: 5 May 2015
- **Information Day: 7 May 2015, Auditorium Madou (Brussels)**
- Deadline: 27 August 2015
- Evaluation
 - Remote 14-25/09/2015
 - Consensus week 5-9/10/2015 (Experts ?)
- Indicative budget: 123 M€

Pillar	Action Type	# Topics	Indicative budget (M€)
Transport	RIA	5	25
Energy	RIA	6	20
	IA	3	34
Overarching	RIA	1	2
	IA	2	39.5
Cross-cutting	CSA	3	2.5
Totals		20	123

- Technologies for Transportation Systems
 - Road Vehicles
 - Car & Bus demonstration projects
 - Improvement of fuel cell
 - APUs for trucks or recreational vehicles
 - Two wheelers under discussion
 - Non-road mobile vehicles and machinery
 - Deployment of Forklifts and material handling vehicles
 - Refuelling infrastructure
 - Maritime, rail and aviation application
 - APUs for different applications and propulsion for boats

Transport pillar FCH-02 2014

Topic	Type of Action	Ind. Budget M EUR
FCH-01.1-2015: Low cost and durable PEMFCs for transport applications	Research & Innovation (RIA)	25
FCH-01.2-2015: Diagnostics and control for increased fuel cell system lifetime in automotive applications		
FCH-01.3-2015: Development of Industrialization-ready PEMFC systems and system components		
FCH-01.4-2015: Adaptation of existing fuel cell components and systems from road to non-road applications		
FCH-01.5-2015: Develop technologies for achieving competitive solutions for APU transport applications based on existing technology		

Topic 1.1: Low cost and durable PEMFCs for transport applications

Challenge

- Need to develop further existing concepts for key MEA components

Scope

- **Must**
 - Validate performance and durability on MEAs (>150cm²), using experimental and modelling evaluations
 - Understand component and stack degradation mechanisms
 - Align specifications and interfaces for each component and architecture
 - Define, achieve and evaluate new architectures and prototypes optimizing electrochemistry, water and heat management
- **Demonstration of full size stack is mandatory**
- **Other objectives are optional (see topic text)**

Impact

- Reach MAWP KPIs on power density, durability and cost
- Advanced developments on catalyst layer, GDL, MPL, BPP, MEA that meet technical and economic requirements

Indicative Funding; No. of projects

- EU contribution of 6 MEuro; 1 project; 3-4 years

Other information

- TRL4 @ start, TRL6 @ end

Overarching projects FCH-02 2014

Topic	Type of Action	Ind. Budget M EUR
FCH-03.1-2015: Large scale demonstration of Hydrogen Refuelling Stations and FCEV road vehicles - including buses and on site electrolysis	Innovation (IA)	39.5
FCH-03.2-2015: Hydrogen territories		
FCH-03.3-2015: Hydrogen delivery with high capacity compressed gas trailer	Research & Innovation (RIA)	2

Topic 3.1: Large scale demonstration of Hydrogen Refuelling Stations and FCEV road vehicles - including buses and on site electrolysis

Challenge

- Improve performance and lower costs of both fuel cell electric vehicles (FCEVs) and hydrogen refuelling infrastructure to strengthen customer acceptance.
- Integrate of electrolysis in HRS to offer balancing services to the power industry.

Scope

- **Vehicles:**
 - At least 200 FCEVs.
 - Passenger cars, utility vehicles and buses can be included
 - Minimum 36 months in operation.
- **HRS:**
 - At least 20 HRS
 - High volumes of hydrogen per day with back to back refuelling
 - Minimum operation of 5 years
- **On-site Hydrogen production & grid support**
 - Demonstrate the use of fluctuating renewable energy sources for hydrogen supplied to the HRS
 - Develop a model of the required electrical behaviour
 - Identify preferred electrolyser and HRS design (for both grid balancing and providing the hydrogen demand)
 - Demonstrate cost effective and optimised running strategies for a cluster of electrolysers acting as a single capacity
 - Electricity consumption below 60 kWh/kgH₂
- **Other objectives**
 - Prepare for the use of low-carbon hydrogen and aim to reduce the carbon intensity of the hydrogen refuelled by at least 50% on a well-to wheel basis as compared to new gasoline and diesel vehicles
 - Gather new learning on customer acceptance, techniques for the operation of a station network, business models for national HRS roll-out, technology performance and the impact of different national policies on roll-out effectiveness

Topic 3.1: Large scale demonstration of Hydrogen Refuelling Stations and FCEV road vehicles - including buses and on site electrolysis (cont.)

Impact

• Vehicles

- At least 80% of the vehicles to be deployed in the project should be “next” generation
- Passenger cars:
 - 6,000h vehicle operation lifetime
 - Vehicle range > 400 km
- Buses:
 - >15,000h / 2 x 8,000h vehicle operation lifetime initially, minimum 20,000h lifetime as program target
 - Availability >90% (to be measured in available operation time)
- Two funding levels for vehicles: “high” and “lower”. Maximum 20% of the vehicles funded at high funding level. The rest, and any vehicle introduced after the third year of the project will be funded at the lower level.

• HRS

- Overcoming the barriers to the roll-out of FCEVs (5/9)
- For cars: provide a clear and configured HRS network
- For busses: allow for supply to a realistically scaled bus fleet of up to 20 buses
- Availability of the station of 98%
- An average maximum funding per HRS is 700,000 €, excluding electrolysis

• On-site hydrogen production & grid support

- At least four electrolyzers operated as a single system
- Total installed capacity of electrolysis funded by this project at least 1 MW (with at least 50% of the capacity in decentralised mode).

• Other

Indicative Funding; No. of projects

- EU maximum contribution that may be requested of 35 MEuro; 1 project; 6 years

Other information

- TRL6-7 @ start, TRL7-8 @ end

- Technologies for Energy Systems
 - Fuel cell systems for combined heat and/or power on industrial, local, domestic scales and small applications
 - Hydrogen production from renewable electricity
 - Large green hydrogen production systems compatible for (smart) grid integration
 - Large scale hydrogen storage and injection of hydrogen in the natural gas grid
 - Re-electrification
 - Hydrogen production with low carbon footprint from other resources and waste hydrogen recovery
 - Hydrogen storage, handling and distribution

Topic	Type of Action	Ind. Budget M EUR
FCH-02.1-2015: Improved electrolysis for Off-grid Hydrogen production	Research & Innovation (RIA)	20
FCH-02.2-2015: Improved electrolysis for Distributed Hydrogen production		
FCH-02.3-2015: Development of co-electrolysis using CO ₂ and water		
FCH-02.4-2015: Proof of concept of HT electrolyser at a scale >70 kW		
FCH-02.5-2015: Development of technology to separate hydrogen from low-concentration hydrogen streams		
FCH-02.6-2015: Development of cost effective manufacturing technologies for key components or fuel cell systems		
FCH-02.7-2015: MW or multi-MW demonstration of stationary fuel cells	Innovation (IA)	34
FCH-02.8-2015: Sub-MW demonstration of stationary fuel cells fuelled with biogas from biowaste treatment		
FCH-02.9-2015: Large scale demonstration μ CHP fuel cells		

Topic 2.6: Development of cost effective manufacturing technologies for key components or fuel cell systems

Challenge

- Step-up from small scale production towards higher volumes
- Develop/apply novel manufacturing technologies, e.g. laser welding, coating, 3D printing, molding and casting of materials that are used for fuel cell system components and /or fuel cell stacks

Scope

- Use best in class manufacturing technologies, production processes, equipment and tooling with cost impact
- Develop industry-wide agreements for standard BoP components for FCs, including heat exchangers, reformers, converters, inverters, post-combustors, actuators and sensors

Impact

- Potential cost reduction of key components for system CAPEX of max 12.000 €/kW (residential), less than 7,500 €/kW (commercial) and less than 3,000 €/kW (industrial)
- Min 97% availability due to implemented quality systems

Indicative Funding; No. of projects

- EU contribution of 2 M €; max 3 projects

Other information

- TRL 4/5→6/8 (segment dependent), Eligibility criterion: >1 member of IG or RG

Topic 2.7: MW or multi-MW demonstration of stationary fuel cells

Challenge

- Achieve market entry of FCs in commercial/industrial segments through realisation of large demos to demonstrate feasibility, confidence building & ↓ TCO

Scope

- 1 MW up to several MW CHP from NG or H₂
- Integration and validation of FC power plant in commercial/industrial applications
- Business plans and service strategies; create partnerships; end-users experience

Impact

- Reduce the overall energy costs; build trust among stakeholders, create jobs
- Reduce use of primary energy by electrical $\eta > 45\%$, total $\eta > 70\%$
- Reduce CAPEX < 4,000 €/kW for systems ≥ 1 MW; 3,000-3,500 €/kW for systems ≥ 2 MW
- Demonstrate technical and financial viable solution: H₂ sources, maintenance costs, FC lifetime

Indicative Funding; No. of projects

- EU contribution of 9M € for 1 MW (+ 1.5 M € for additional MW), max 10-12 M €; 1 prj.

Other information

- TRL 7-> 8, Eligibility criterion: >1 member of IG or RG; 5 years

- Cross-cutting research activities
 - Social acceptance and public awareness
 - Education and training
 - Safety
 - Pre-Normative Research
 - Building databases for environmental, economical, socio-economic subjects
 - Identification and development of financial mechanisms to support market introduction
 - Support portable applications & other niche market fuel cell solutions
 - socio-economic research to determine environmental and societal impact
 - Recycling of FCH technologies
 - Other supporting activities

Cross-cutting Activity Area FCH-04 2015

Topic	Type of Action	Ind. Budget M EUR
FCH-04.1-2015: Recycling and Dismantling Strategies for FCH Technologies	Coordination & Support Action (CSA)	2,5
FCH-04.2-2015: Novel Education and Training Tools		
FCH-04.3-2015: Best practices guidelines on safety issues relating to current and emerging FCH Technologies		

Cross-cutting Activity Area

Topic 4.1: Recycling and Dismantling Strategies for FCH Technologies

Challenge

- FCH technologies will be required to **meet the environmental standards**.
- Therefore, **safe recycling and dismantling FCH products** at the end-of-life should be envisaged, with special attention towards the **recycling of critical and scarce materials**.

Scope

- Definition and assessment of **current and novel strategies for recycling and dismantling** FCH Technologies.
- Identify **critical raw and rare materials and components**.
- Development of **Life Cycle Assessment models**.
- Development of **business model** on how to promote and make economically feasible the strategies proposed.
- Recommendations for **introduction of the new processes in the recycling centers** .
- **Showcase in a recycling center** for at least one FCH product.

Impact

- Provide **guidance on future need and focus of recycling strategies**
- Establish a **road map for recycling and dismantling strategies** for FCH technologies.
- **Harmonize procedures** at EU level for both phases: recycling and dismantling.
- Pave the way for future large demonstration projects validating the business model proposed.

Indicative Funding; No. of projects; Expected duration

- EU contribution of 0.5 MEuro; 1 project; 2-3 years

From FP7 to H2020 – Changes in the Rules for Participation

Innovation, Simplification and Coherence

- **A single set of rules**
 - Covering all research programmes and funding bodies
 - Aligned to the Financial Regulation, coherent with other new EU Programmes
- **3 evaluation criteria: Excellence – Impact – Implementation**
- **Simpler rules for grants**
 - Single funding rate per project (max. 100%/70%)
 - Flat rate for indirect costs (25% of eligible direct costs)
- **New balance between trust and control**
 - Broader acceptance of participants accounting practices for direct costs
- **Shorter time-to-grant: 8 months – no more negotiations**



Shortening the Time to Grant – How?



- **Grant Agreement Preparation** rather than negotiation:
 - Legal and financial compliance of the proposal including ethics recom.
 - Proposal format ready for quick grant preparation
- Legal entity validated in parallel to grant preparation
- Limited FVC (only private coordinator grant amount $\geq 500,000\text{€}$)
- No more paper: e-communication & e-signature of grants

This remains an important challenge for all involved parties !

Types of Actions – Annex D

■ RIA - Research and Innovation Actions

Actions with **Research and Development activities at the core of the project** intending to establish new scientific and technical knowledge and/or explore the feasibility of a new or improved technology, product, process, service or solution

- **may include basic and applied research**, technology development and integration, testing and validation on a **small-scale prototype** in a laboratory or simulated environment
- **may contain** closely connected but **limited demonstration or pilot activities** aiming to show technical feasibility in a near to operational environment

funding rate
max. **100%**

■ IA- Innovation Actions

Actions primarily consisting of **activities directly aiming at producing plans and arrangements or designs for new, altered or improved products, processes or services**. For this purpose they may include prototyping, testing, demonstrating, piloting, **large-scale product validation** and market replication

*Funding 100% for non-profit legal entities

funding rate
max. **70%***

■ CSA - Coordination and Support Action

Actions consisting primarily of **accompanying measures** such as **standardization, dissemination, awareness-raising and communication, networking, coordination** or support services, policy dialogues and mutual learning exercises and studies, including design studies for new infrastructure and may also include complementary activities of strategic planning, networking and coordination between programmes in different countries.

funding rate
max. **100%**

Do's and Don'ts

(best practise from the previous calls)

- **What exactly is the INNOVATION of the proposal?**

- Do:** Include a clear State of the Art, SoA (not only EU, but international) which illustrates the novelty

- Do:** Provide details of any "preliminary" activities already performed by some members of the consortium to show that they don't start from 'scratch' and that the risk is limited (or address the risk!)

- **What are you planning to do and how?**

- Do:** Critically review the number of deliverables (too many OR too few are bad indicators + confidentiality!)

- Do:** Provide clear milestones which allow to evaluate the progress of the project (including Go/NoGo decision points)

- Do:** Structure the Work Plan in a clear and consistent way showing the relationship among the different Work Packages (WP) and/or tasks

- Do:** Try to have a balanced (sectorial and geographical) and complementary consortium; avoid adding "cosmetic" partners

- Don't:** mix deliverables and milestones

- Don't:** Avoid using sub-contractors and third parties - a strong consortium should be able to perform the major tasks with their own resources

***The proposal should provide
clear and short answers to
these questions***

- **How is your budget/resources planned over the activities and duration of the project ?**

Do: explain as clear as possible the allocated resources (e.g. man-months) per partner and activities - avoid to over-estimate the effort needed

Do: try to declare as accurately as possible the estimated costs, especially for major costs

Don't: include partners with 0 total costs - the requested funds could be zero, but the total should be definitely higher, reflecting their contribution to the project

- **What can be expected as a result of the project?**

Do: Describe precisely the main outcome of the project - avoid using too many ambiguous terms (e.g. illustrate, evaluate, assess, recommend, etc)

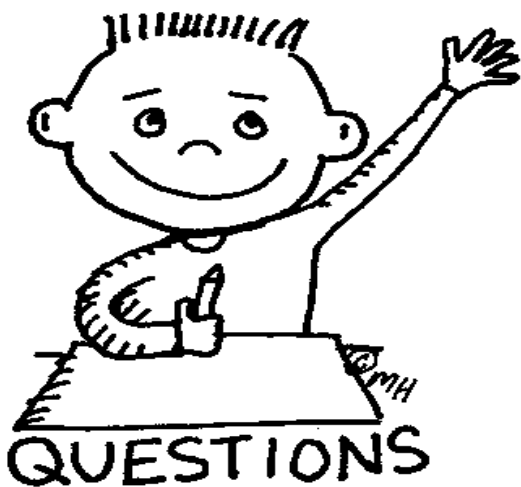
- **What would be the impact on energy technology?**

Do: Describe the potential impact of the "project outcome" not of the "technology" being addressed

Do: Provide "quantitative" estimates of critical parameters (e.g. performance, size, weight, cost, etc) which allow to compare the resulting outcome with the SoA



Thank you for your attention !



further info
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FCH JU official website:
www.fch.europa.eu



European Industry Grouping
(NEW-IG):
<http://www.new-ig.eu/>



European Research Grouping
(N.ERGHY):
<http://www.nerghy.eu/>

