



FUEL CELLS AND HYDROGEN
JOINT UNDERTAKING

**EUROPEAN HYDROGEN
SAFETY PANEL (EHSP)**
(ID205)

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25 September 2019

**8th INTERNATIONAL
CONFERENCE ON
HYDROGEN SAFETY**

24-26 September 2019

ADELAIDE, AUSTRALIA

Strong public-private partnership with a focused objective

EU Institutional Public-Private Partnership (IPPP)



Fuel Cells & Hydrogen Joint Undertaking (FCH 2 JU)



Industry grouping
More than 130 members
50% SME



European
Commission



Research grouping
over 60 members

To implement an *optimal research and innovation programme* to bring FCH technologies to the point of market readiness by 2020



FCH JU programme implementation (2018)



Energy

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



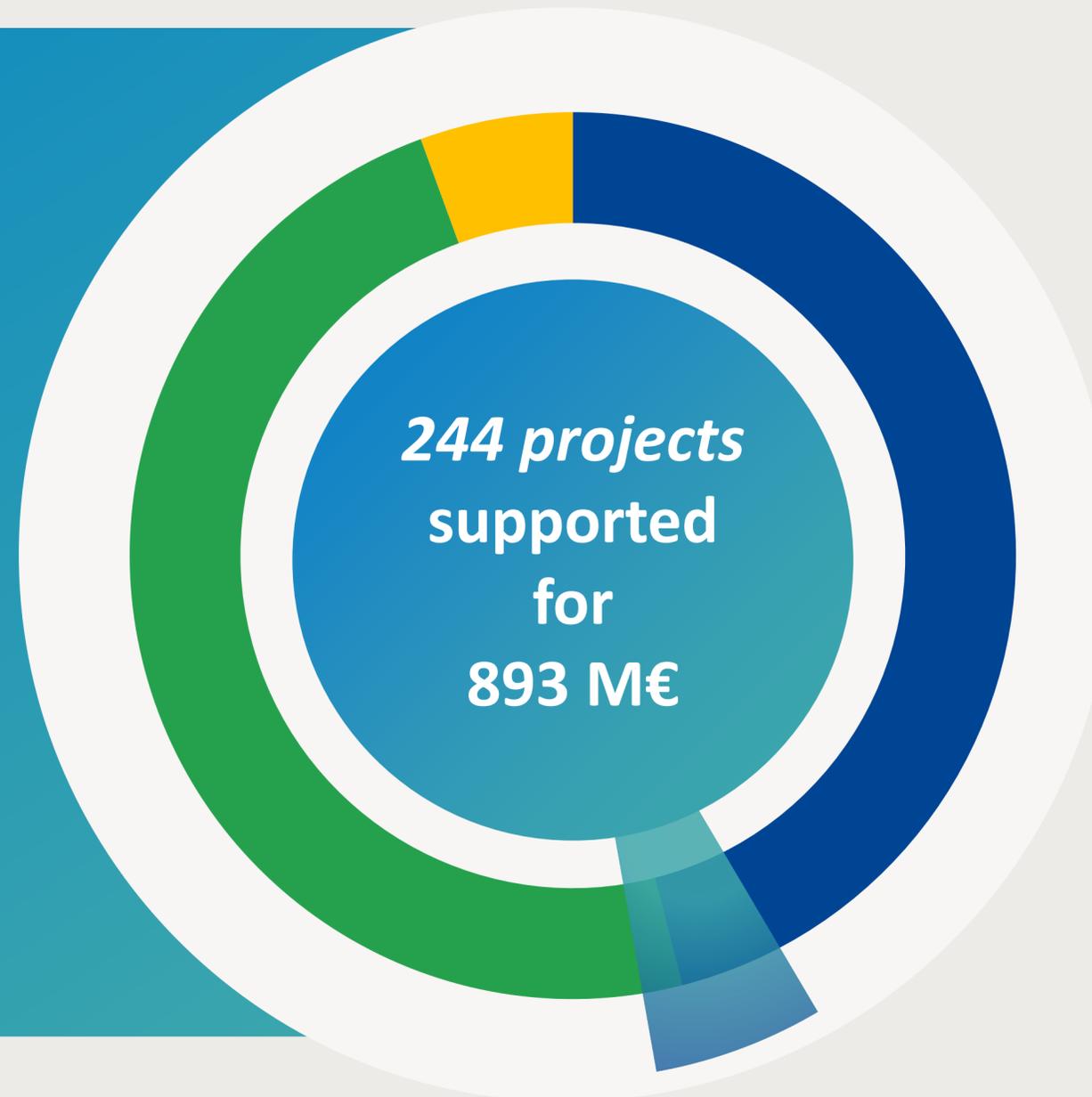
Transport

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



Cross-cutting

- E.g. standards, safety, education, consumer awareness ...



47 %



418 million euros

135 projects

42 %



376 million euros

65 projects

6 %



53 million euros

40 projects



5 %

46 million euros

4 projects

Similar leverage of other sources of funding: 892 m€



Supporting activities for market uptake

FCH 2 JU safety-related activities



Cross-cutting Areas



Legal, administrative and regulatory framework



Education and training



Safety



Social awareness & public acceptance



Sustainability



Databases & Monitoring

Complementary Actions

Regulations, Codes and Standards Strategy Coordination Group (RCS SCG)

European Hydrogen Safety Panel (EHSP)

Collaboration with the Joint Research Center (JRC)

Initiatives: FCH Regions, FCH Value Chain, ...

Funding and financing support services

Studies, ..., ... ,...



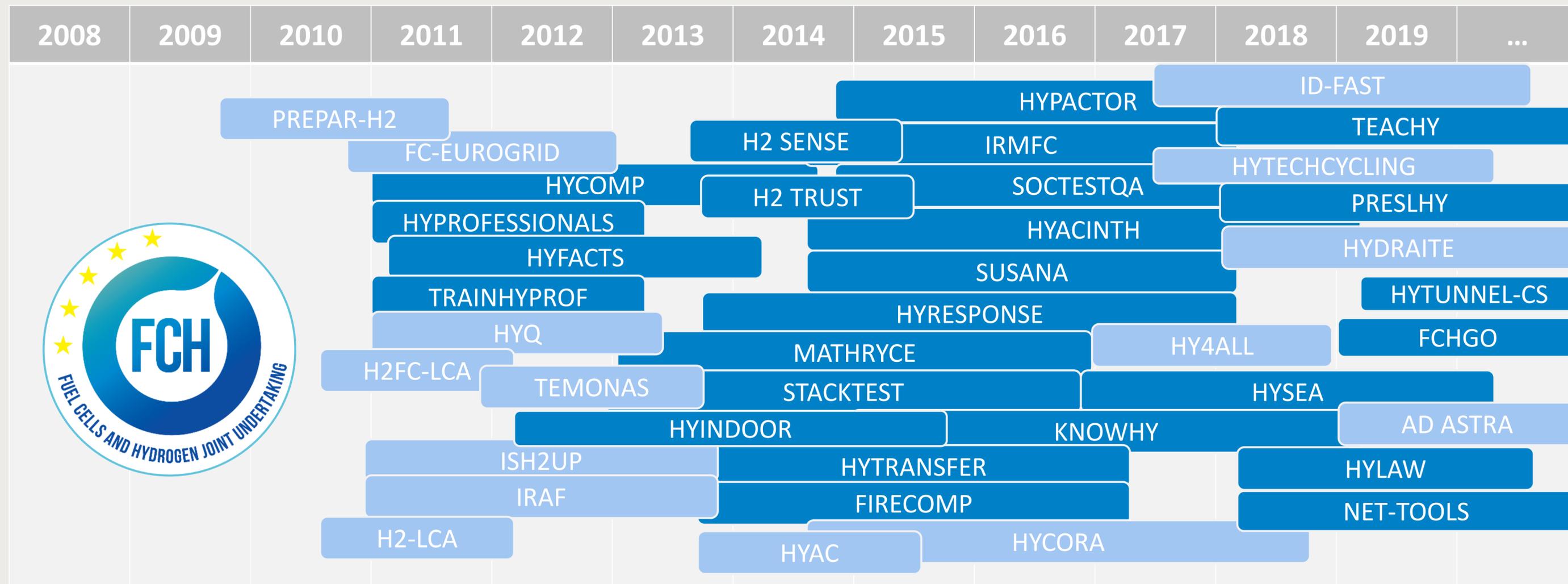
Safety-related activities

Safety is an integral part of projects portfolio

Multidisciplinary approach on safety issues



> 60% Cross-cutting projects addressing safety directly or indirectly



An example of project outcomes

HYSEA Project - 1.5 m€ of FCH JU funding



Improving Hydrogen Safety for Energy Applications through pre-normative research on vented deflagrations

Safer FCH technologies in confined spaces

Real-life enclosures with industry representative obstacles

Main objective:

To provide recommendations for standards on hydrogen explosion venting mitigation systems and to develop models

- Experimental campaigns
- Engineering models
- CFD & FE models
- Blind-prediction benchmark studies



www.hysea.eu

An example of project outcomes

HYSEA – at a glance



Achievements

> 200 experiments 20-foot ISO container and Small-Size enclosures

Engineering models, CFD-based & FE- based tools

Recommendations for standards (EN 14994, NFPA 68)

Close international coopération (China)

Many dissemination activities



An example of project outcomes

HYRESPONSE PROJECT - 1.8 m€ of FCH JU funding



European hydrogen emergency response training program for first responders



***FIREFIGHTERS
are ready for
hydrogen***

**First responder educational
and practical hydrogen
safety training**

Main objective:

Establish the World's first comprehensive training programme for **FIRST RESPONDERS**

- Educational training
- Operational training
- Virtual reality training



www.hyresponse.eu Dedicated **public access area** of the HyResponse website

An example of project outcomes

HYRESPONSE –at a glance



Achievements

About 71 firefighters trainees from about 15 countries, 21 international observers

Exercise scenarios using virtual reality gives first hand experience

Real-life scenarios, to practice what has been learned

Realization of a European emergency response guide

Many dissemination activities



Breaking news: Call for proposals 2019

Preliminary results - Topic 4.1



HYRESPONDER project (under preparation) - 3 years; 1m€ of FCH JU funding **European Hydrogen Train the Trainer Programme for Responders**

*Building on
HYRESPONSE:*

**First and second responders
educational and practical
hydrogen
safety training**

16 partners from industry, research , public & fire services

Train trainers from ≥ 10 European countries, ≥ 7 languages

Workshops for responders in at least 10 countries

Update the European Emergency Response Guide (i.e. LH2)

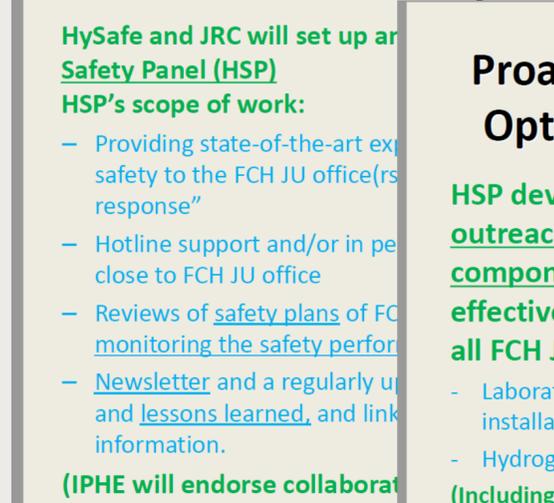
Materials on an educational NET-tools e-Platform

International forum of responders in hydrogen safety training

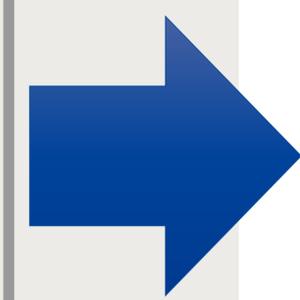


European Hydrogen Safety Panel (EHSP)

Background – HYSAFE as initiator



Hamburg
September 2017



Letter of intent (October 2016)

European Hydrogen Safety Panel (EHSP)

Introduction: mission, vision, composition



The Fuel Cell and Hydrogen 2 Joint Undertaking (FCH JU) launched the European Hydrogen Safety Panel (EHSP) in 2017. The role of the EHSP includes the support of FCH JU at program and project levels, thereby assuring that hydrogen safety is adequately addressed and managed.

The panel shall also promote and disseminate safety culture and state-of-the-art knowledge and competence about hydrogen outside of the FCH JU.

The ambition for the EHSP is to engage a balanced pool of worldwide recognized experts from academia, industry and other stakeholders, and thereby provide the necessary scientific and engineering competence to make practical and science-based recommendations on hydrogen safety to the FCH JU.

A chairperson and four task force (TF) leaders, elected by and from the actual 16 members of the panel, coordinate the daily operation of the panel.

An updated list of EHSP members is publicly available on the FCH JU website.

<https://www.fch.europa.eu/page/european-hydrogen-safety-panel>



European Hydrogen Safety Panel (EHSP)

Operative structure. Task Forces



Activities of the Panels are grouped in 4 working groups and organized in Task Forces (TF)

- TF1. Support at Project Level
- TF2. Support at Program Level
- TF3. Data Collection and Assessment
- TF4. Public Outreach

Working groups



European Hydrogen Safety Panel (EHSP)

Operative structure. Task Forces



TASK FORCE 1. Support at Project Level

The EHSP activities under this category aim at coordinating measures to avoid accidents by integrating safety learnings, expertise and planning into FCH 2 JU funded projects by ensuring that all projects address and incorporate the state-of-the-art in hydrogen safety.

Building on the safety guidance document for hydrogen and fuel cell projects, the aim is to release a practical fit-for-purpose document tailored for the FCH 2 JU projects.

TASK FORCE 2. Support at Program Level

In addition to support at project level, which represents a significant share of the FCH 2 JU activities, the EHSP works under this category include a set of activities with a broader and cross-cutting dimension focused on the FCH 2 JU program itself and how safety aspects can be enhanced within the overall program. Activities also include support in specific occasions for answering urgent questions related to hydrogen safety, acting as representative of the FCH 2 JU on safety aspects, or the provision of specific guidelines for safe use of hydrogen in the public domain.



European Hydrogen Safety Panel (EHSP)

Operative structure. Task Forces



TASK FORCE 3. Data Collection and Assessment

The EHSP tasks under this category encompassed the analysis of safety data and events contained in the revamped European Hydrogen Safety Reference Database (HIAD 2.0) operated by JRC and supported by the FCH 2 JU. In close collaboration with JRC, members of the EHSP reviewed more than 250 events. The outcome from this assessment will be a report on the status of the Hydrogen Safety Reference Database, including recommendations for future research in this field.

TASK FORCE 4. Public Outreach

The EHSP web page (<https://www.fch.europa.eu/page/european-hydrogen-safety-panel>) is the primary communication channel. The activities related to public outreach in 2019 include the development of a communication strategy, presentations at international conferences and updates to the web page.



European Hydrogen Safety Panel (EHSP)

First outcomes



What has been done ?

The activity in the 4 TFs is being carried out according to the plan.

TF1.

Safety Planning
Guidance Document.

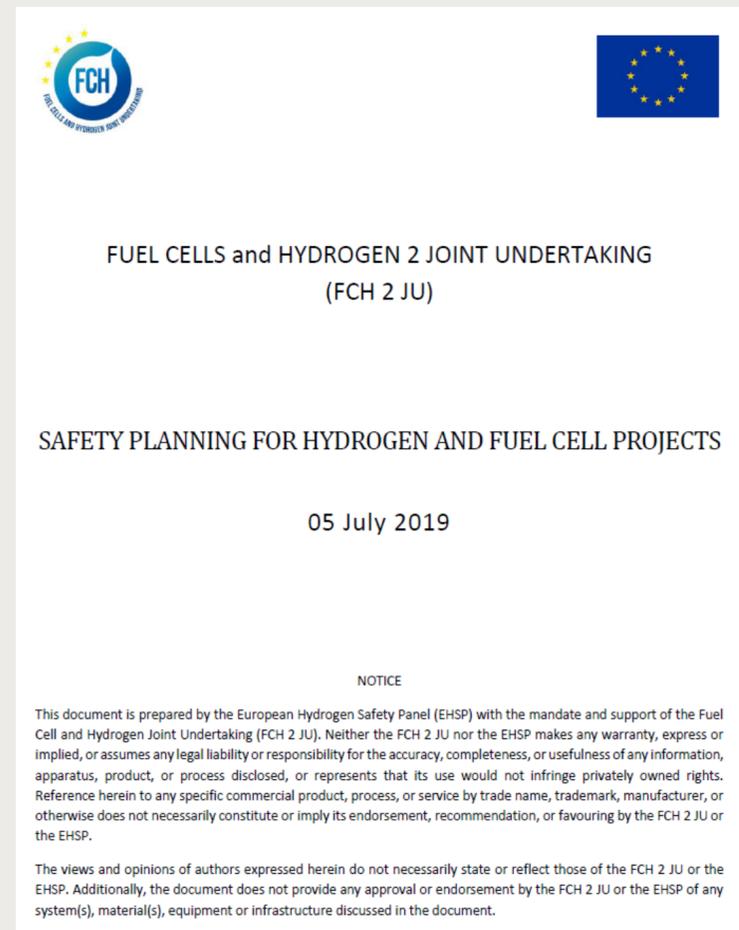


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<https://fch.europa.eu/sites/default/files/Safety Planning for Hydrogen and Fuel Cell Projects Release1p31 20190705.pdf>

European Hydrogen Safety Panel (EHSP)

First outcomes



Template for Safety Plan.

No	Topic	Explanation	Input
1. Project Brief			
1a.	General Information	Title of project: Term (duration): _____ / _____ to _____ / _____ Funding: Coordinator (Person, Institution):	
1b.	Consortium	Give name list of partners and highlight those with hydrogen safety specific experience	- ... - ... - ...
1c.	Safety Responsible Person	Give name and contact data of person responsible for safety of the project "safety officer" (better one than many, and usually the author of this document)	
1d.	Type of Work	Describe the specific nature of the work	<input type="checkbox"/> laboratory-scale research <input type="checkbox"/> bench-scale testing <input type="checkbox"/> engineering development <input type="checkbox"/> safety engineering <input type="checkbox"/> prototype operation <input type="checkbox"/> demonstration <input type="checkbox"/> commercial application <input type="checkbox"/> other: _____
1e.	Description of Work	Short summary of the Description of Activities (maybe copy the short summary of the contract)	

No	Topic	Explanation	Input	Responsible, if not "safety officer"
2. Project Safety				
2a.	Relevant regulation, codes, standards and safety policies	List all relevant regulation and applied codes and standards for your project	- - -	
2b.	Hazard Identification and Risk Assessment	Provide a chronological list of hazard identification procedures and risk assessments done (or planned) and summarize key results or provide full documentation in attachments	- - -	
2c.	Prevention and mitigation	List all prevention strategies and installed mitigation technology used (e.g. ventilation, water sprays, sensors, ...). Follow the first 8 safety principles, (potential outcome of 2b)		

No	Topic	Available?	Where (Link, Library, Room, ...)
4. Checklists and other helpful documents (for EHSP highly relevant documents in bold font)			
	Block flow diagram (PID) or simplified process flow diagram	<input type="checkbox"/>	
	ATEX zones	<input type="checkbox"/>	
	Process chemistry	<input type="checkbox"/>	
	Material of construction	<input type="checkbox"/>	
	Material data safety sheets	<input type="checkbox"/>	
	Material and energy balances	<input type="checkbox"/>	
	Electrical classification	<input type="checkbox"/>	
	Pressure relief system design	<input type="checkbox"/>	
	Ventilations system design	<input type="checkbox"/>	
	Technical documentation of further safety / mitigation equipment	<input type="checkbox"/>	
	Checklists before or after start	<input type="checkbox"/>	
	Results of ISV before or at project start	<input type="checkbox"/>	
	Results of ISV or risk assessment before hardware installation	<input type="checkbox"/>	
	Results of ISV or risk assessment before operations	<input type="checkbox"/>	

1f.	Project Phases (origin of change)	What is done in which phase of the project (free text input)	
1g.	Hydrogen Inventory	Type of hydrogen storage and maximum inventory of hydrogen physically stored on site(s) per storage type	<input type="checkbox"/> p < 2 bar _____ kg <input type="checkbox"/> p < 20 bar _____ kg <input type="checkbox"/> p <= 200 bar _____ kg <input type="checkbox"/> p > 200 bar _____ kg <input type="checkbox"/> liquid (cryogenic) _____ kg <input type="checkbox"/> solid storage (metal hydride) _____ kg <input type="checkbox"/> other (e.g. LOHC): _____ kg
1h.	Location	Where is your activity, respectively hydrogen located (industrial, public, colocation with other technologies and hazards, etc)	<input type="checkbox"/> specially controlled area <input type="checkbox"/> industrial environment <input type="checkbox"/> research lab <input type="checkbox"/> public <input type="checkbox"/> co-located with other hazardous materials, fuels etc.: _____

No	Topic	Explanation	Input	Responsible, if not "safety officer"
3. Operations Management				
3a.	Nominal and limit values of critical process parameters	Provide a list of controlled or easy to check process parameters, like filling status of a liquid, pressure and or temperature and there corresponding design and limit values (potential outcome of 2b)		
3b.	Procedures for operation	Refer to checklists for start up/ and shut-down, operation instructions (potential outcome of 2b and possibly attached in 4)		
3c.	Emergency alarm, evacuation and response plans	(maybe just attach them in 4 and indicate this here)		
3d.	Personnel education and training	Describe or list all measures where involved persons (operators, first responders,...) are participating in courses and explain how this is documented		
3e.	Monitoring and Periodic Reviews	Describe the procedures and periodicity of checking whether everything above is in place and known by all relevant people		
3f.	Reporting of safety events and lessons learned in HELLEN and HIAD	Describe plans for sharing safety critical information		



https://fch.europa.eu/sites/default/files/TemplateForSafetyPlan_20190705.pdf

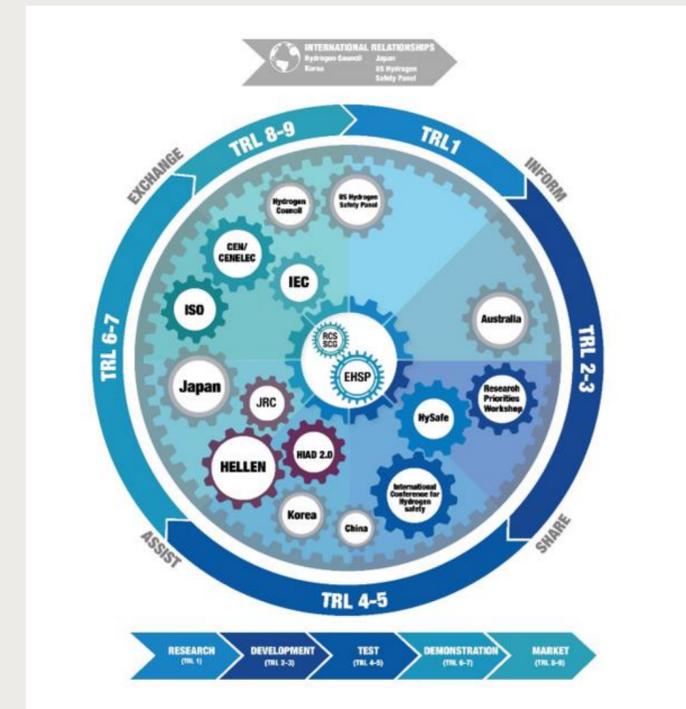
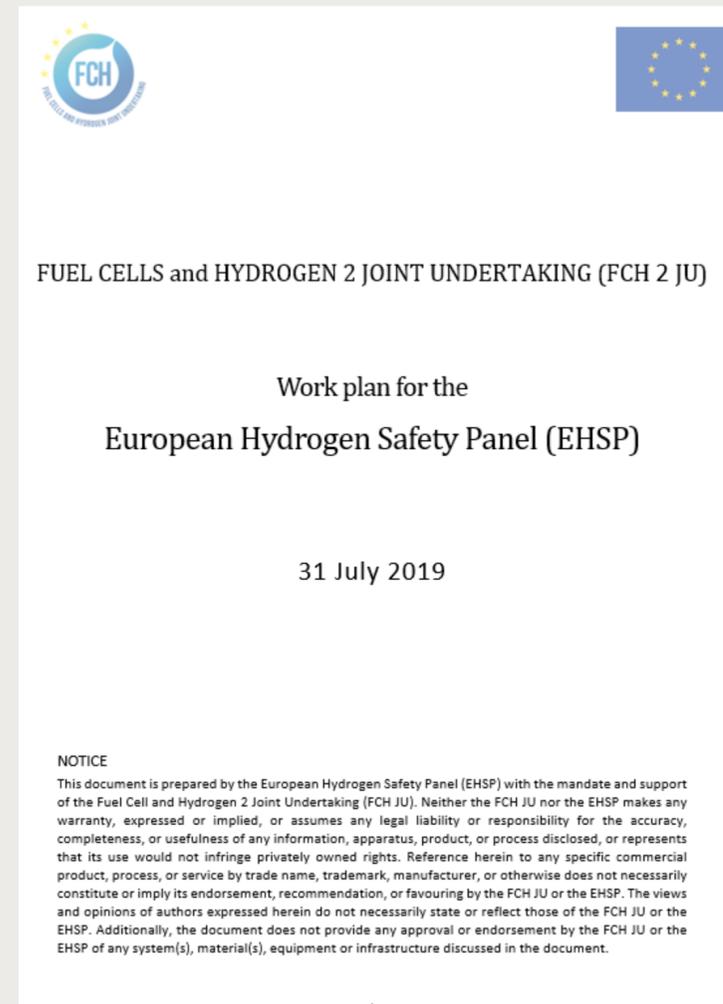
European Hydrogen Safety Panel (EHSP)

First outcomes



TF2.

Work plan and roadmap
for the EHSP



European Hydrogen Safety Panel (EHSP)

First outcomes



TF3.

Hydrogen Incidents and Accidents Data Base HIAD 2.0

FUEL CELLS and HYDROGEN 2 JOINT UNDERTAKING (FCH 2 JU)

D3.2 – Assessment and lessons learnt from HIAD 2.0

28 July 2019

NOTICE

This document is prepared by the European Hydrogen Safety Panel (EHSP) with the mandate and support of the Fuel Cell and Hydrogen Joint Undertaking (FCH 2 JU). Neither the FCH 2 JU nor the EHSP makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favouring by the FCH 2 JU or the EHSP.

The views and opinions of authors expressed herein do not necessarily state or reflect those of the FCH 2 JU or the EHSP. Additionally, the document does not provide any approval or endorsement by the FCH 2 JU or the EHSP of any system(s), material(s), equipment or infrastructure discussed in the document.

JOINT RESEARCH CENTRE

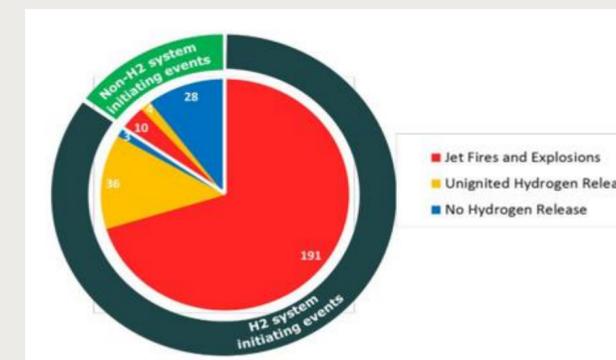
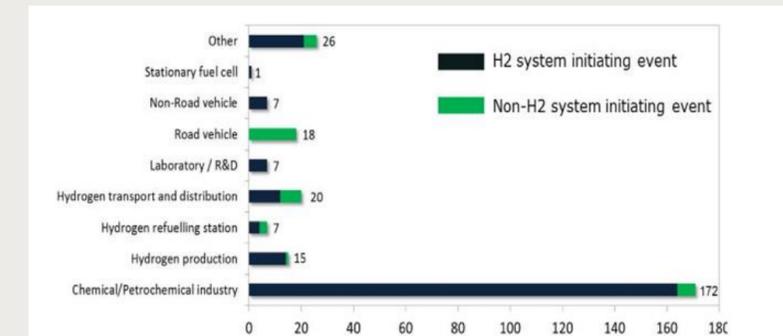
HIAD - Event Selection

Event classification: Hydrogen system initiating event, Non-hydrogen system initiating event, False positive

Physical Consequences: Jet Fires and Explosions, No Hydrogen Release, Unignited Hydrogen Release

Application: Chemical/Petrochemical industry, Hydrogen production, Hydrogen refuelling station, Hydrogen transport and distribution, Laboratory / R&D, Non-Road vehicle

CURRENT EVENT COUNT: 272



LESSONS LEARNT

- Inspection and maintenance
- Personnel
- Process modification
- Plant modification
- New equipment
- Cascading events
- Miscellaneous cases
-



European Hydrogen Safety Panel (EHSP)

First outcomes



TF4.

The Communication Strategy

PRELIMINARY DRAFT – EHSP Communication strategy 2020-2025 – EHSP CONFIDENTIAL



EHSP CONFIDENTIAL

EHSP COMMUNICATION STRATEGY 2020-2025

Promoting the activities and objectives of the European Hydrogen Safety Panel (EHSP)

Version: **1.1**

Last updated: **07.09.2019**

Contributors: **Trygve Skjold, Iñaki Azkarate Peña, Etienne Studer, ...**

Distribution: **EHSP CONFIDENTIAL**

PRELIMINARY DRAFT – EHSP Communication strategy 2020-2025 – EHSP CONFIDENTIAL

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European Hydrogen Safety Panel (EHSP)

Looking at the future



Future Plans

Future Activity of EHSP

1. Project Level Activities

- Continue to update the safety guidance document
- Promote the use of the GUIDANCE to generate pre-normative knowledge
- Promote safety related support to projects
- Help to enforce the relevant knowledge of RCS in the projects;
- Act as expert monitor to assess all safety related project deliverables
- Promote the participation of project teams to the ICHS conference;
- Enforce the participation of EHSP in project consortiums

2. Programme Level

- Identify and prioritise safety issues and relevant research that is required within the programme in annual progress reports
- Develop annual call topics from the hydrogen safety knowledge gaps and technological bottlenecks workshop
- Participate in stages organised by FCH JU to prioritise the topics
- Manage and drive the international collaboration in hydrogen safety

3. Data Collection

- To enlarge and improve HIAD 2.0 database;
- To promote HIAD 2 highlighting lessons to be learnt of incidents
- To formulate recommendations based on lessons learned;
- To provide specific report on research progress in the field of hydrogen safety
- To promoting the applications of the identified safety related deliverables

4. Public Outreach

- To establish a suitable communication strategy for the EHSP;
- To establish a set of key performance indicators (KPIs) for the communication activities;
- To maintain and develop the EHSP web page, including:
 - An updated list of the members of the EHSP,
 - News articles related to hydrogen safety,
 - Facts and myths related to hydrogen safety,
 - Reports and notes issued by the EHSP,
 - Links to relevant organisations, projects and other sources of information related to hydrogen safety,
- To present activities from the EHSP at relevant conferences,
- To organise workshops with relevant stakeholders and members of the EHSP
- To issue annual reports that summarise the activities

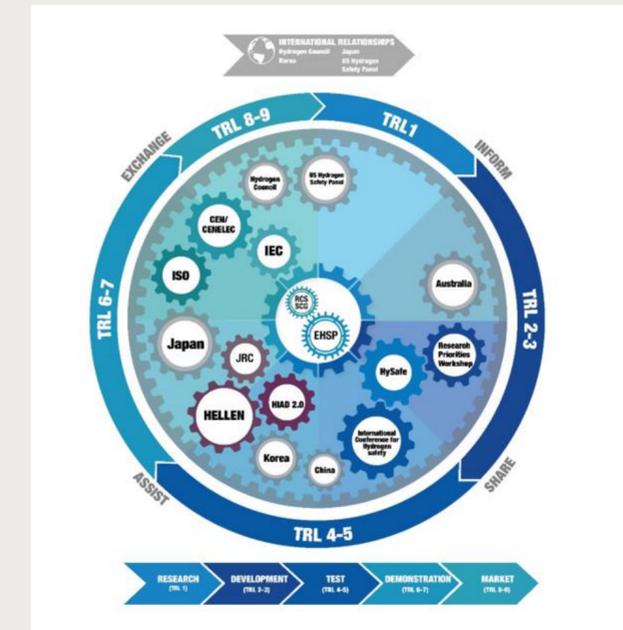
5. Structural and Operational Aspects of the EHSP

To deliver its role successfully one proposal is to modify the structure of the panel structure along the lines shown in Figure 5, where Project and Programme become the leading workstreams to guide the other two, or more if this is decided necessary. This might then allow the EHSP to take a more project based structure to deliver its outputs.



6. EHSP Interactions with External Organisations

- Regulations Codes and Standards (RCS) Strategy Coordination Group (SCG)
- European Commission Joint Research Centre (JRC) (HIAD2.0 & HELEN)
- International Association for Hydrogen Safety's (IA HySafe)
- Hydrogen Council
- The International Partnership for Hydrogen and Fuel Cells in the Economy (IPHE)
- US Hydrogen Safety Panel
- Other Countries: Japan, Korea, China, Australia etc



European Hydrogen Safety Panel (EHSP)

Call for expression of interest open



The screenshot shows the FCH website header with the logo and navigation menu. The 'INITIATIVES' menu item is highlighted. The breadcrumb trail reads 'Home » Initiatives » European Hydrogen Safety Panel'. The main content area features a large blue heading 'CALL FOR EXPRESSION OF INTEREST' and a sub-heading 'Call for expression'. The text describes the call for independent experts to assist the Fuel Cells and Hydrogen 2 Joint Undertaking. A list of additional documents is provided, including a notice of call, legal entity templates, financial identification forms, a registration form, and a privacy statement. A red-bordered box with white text is overlaid on the right side of the page, reading 'Interest in participating? Call for expressions of interest open!'. The footer of the page includes the European Union flag and the text 'FCH VALUE CHAIN'.

FUEL CELLS AND HYDROGEN JOINT UNDERTAKING

EXTRANET Follow in

ABOUT US INITIATIVES PROJECTS STAKEHOLDER FORUM PROGRAMME REVIEW CALLS FOR PROPOSALS & PROCUREMENTS NEWS, EVENTS & MEDIA AWARDS 2018

Home » Initiatives » European Hydrogen Safety Panel

STUDIES

FCH REGIONS

RCS STRATEGY COORDINATION GROUP

EUROPEAN HYDROGEN SAFETY PANEL

Call for expression of interest

GUARANTEES OF ORIGIN FOR HYDROGEN

FCH VALUE CHAIN

CALL FOR EXPRESSION OF INTEREST

Call for expression

Call for expressions of interest to set up a list of independent experts to assist the Fuel Cells and Hydrogen 2 Joint Undertaking for tasks in relation to the European Hydrogen Safety Panel.

The complete details of the call, including all information and objectives of the call, detailed eligibility requirements, and what and how to apply for the application can be found here (hyperlink to our internal document that we have prepared for the call available [here](#))

Additional documents available for this call:

- Notice of call for expression of interest – publication number 2017/S 17-408 15
- [Legal entity templates](#)
- [Financial identification](#)
- [Registration Form](#)
- [Privacy statement](#)

Instructions for applications

Candidates meeting the eligibility criteria contained in the full [Call for Expressions of Interest](#) are requested to submit their applications electronically

**Interest in participating?
Call for expressions of interest open!**





FUEL CELLS AND HYDROGEN
JOINT UNDERTAKING

**EUROPEAN
HYDROGEN SAFETY
PANEL (EHSP)**

(ID205)

**THANK YOU FOR
YOUR ATTENTION !!**