



FUEL CELLS AND HYDROGEN
JOINT UNDERTAKING

EHSP

ICHS 2021

Iñaki Azkarate

24 september 2021



**INTERNATIONAL CONFERENCE ON
HYDROGEN SAFETY 2021**

“Safe Hydrogen for Net Zero”

Edinburgh on 21-24 September 2021

EHSP: European Hydrogen Safety Panel

Background

European Hydrogen Safety Panel (EHSP)



A brief timeline

- In 2006 and 2009 NoE HySafe was suggesting an activity for **sharing lessons learned and hydrogen safety experience across project boundaries** and to **maintain this expertise eventually even beyond program terms**.
- In 2014 the International Association for Hydrogen Safety HySafe proposed the installation of a safety panel to the Executive Director and Governing Board of the FCH JU.
- After several discussions about formal aspects, terms of reference, vision, mission, mandates, etc. the European Hydrogen Safety Panel was launched by the FCH 2 JU in 2017.



Kick-off meeting 2018



Vision // Strategic Role

European Hydrogen Safety Panel (EHSP)



Reflecting the FCH 2 JU vision

- Hydrogen plays a key role in the Energy System constituting a **safe** and sustainable Energy Carrier.
- Hydrogen is an enabler of the Energy Transition towards a decarbonized system.



EHSP ROLE: to provide within FCH-JU **independent safety expertise, objective information, education and training** in different forms for various groups of stakeholders and support the anticipated upscaling of hydrogen energy application.



Mission, Objectives and Corresponding Activities

European Hydrogen Safety Panel (EHSP)



The EHSP assist the FCH 2 JU both at programme and at project level

- in assuring that hydrogen safety is adequately managed, and
- to promote and disseminate hydrogen safety culture



Activities structured in
4 Task Forces



TF1
Project
level



TF2
Program
level



TF3
Data
Collection



TF4
Public
Outreach



Scope of Activities

European Hydrogen Safety Panel (EHSP)



**The EHSP assist the FCH 2 JU both at programme and at project level .
Activities are grouped in the 4 pillars and organised in Task Forces (TF)**

TF1 Support at
Project level



- Coordination of a package of measures to avoid any accident by integrating safety learning, expertise and planning into FCH2 JU funded project.
- e.g. Safety plans review, in-situ reviews, courses, data collection/ monitoring ...

TF2 Support at
Programme level



- answering urgent questions, short introductions to hydrogen safety
- provision of specific guidelines (collecting inputs from projects)
- ...

TF3 Data collection
and assessment



- Support to HIAD - Hydrogen Incidents and Accidents Database
- Analysis of existing events, derive lessons learned and provide recommendations, collaboration with similar activities of the US DoE and EIGA...

TF4 Public
Outreach



- Development of a comprehensive outreach, education and training programme for the safety component of FCH2 JU projects
- Newsletter and website, containing the lessons learned and links



Current EHSP Members – the Pool of Experts

European Hydrogen Safety Panel (EHSP)



Inaki Azkarate



Stuart Hawksworth



Thomas Jordan



Georg Wilfried Mair



Marta Maroño



Daniele Melideo



Vladimir Molkov



Ernst-Arndt Reinecke



Pratap Sathiah



Ulrich Schmidtchen



Etienne Studer



Trygve Skjold



Tom Van Esbroeck



Elena Vyazmina



Jennifer Wen



For more information see Members of the EHSP : <https://www.fch.europa.eu/page/european-hydrogen-safety-panel>

Outcomes: Safety Planning Guidance Document

Products and Services of the EHSP

SAFETY PLANNING AND MANAGEMENT IN HYDROGEN AND FUEL CELLS PROJECTS - GUIDANCE DOCUMENT

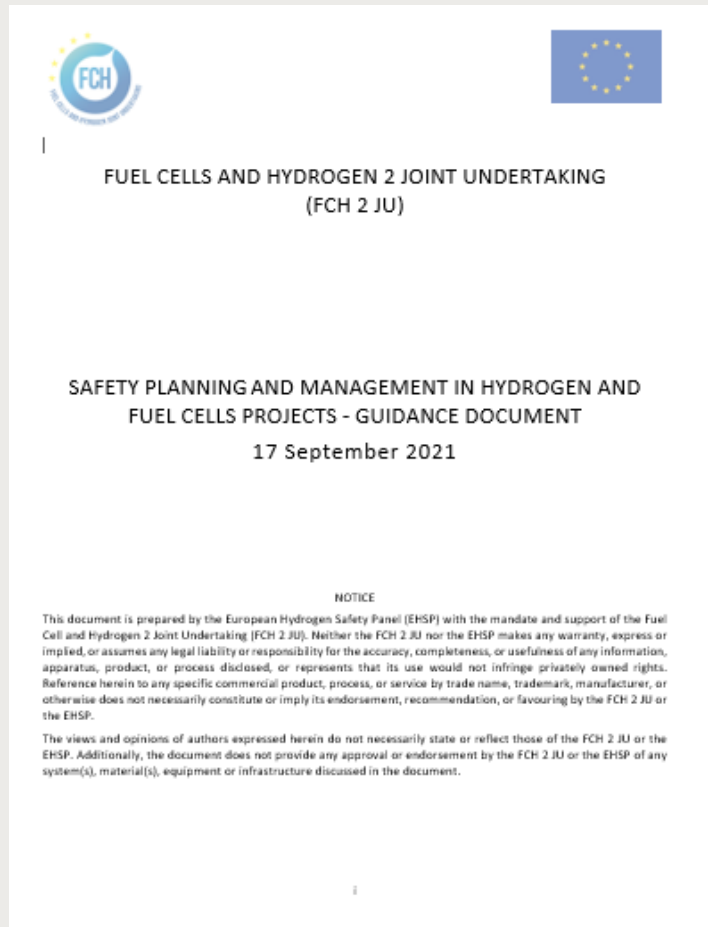


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Outcomes: Workshops

Products and Services of the EHSP

Safety of Electrolysis //



Safe Storage of Hydrogen // Safety at the Hydrogen Laboratory

2020

EHSP
European Hydrogen Safety Panel
Workshop on Safety of Electrolysis
18 November 2020

FCH 2 JU Workshop on Safety of Electrolysis

AGENDA

Remarks	FCH JU
Hydrogen safety Panel (EHSP)	EHSP
Session 1: Safety-related events and lessons learnt	
Incidents and Accidents Database (HIAD 2.0) lessons learnt, recommendations	DO JRC - EC
Lessons learnt - Ilford and Gyeongju in South Korea	EHSP
Lessons learnt	EHSP
Panel discussion - Moderated by the EHSP	
Session 2: Hazards identification for electrolysis	
Typical hazards, Risk Evaluation and Criteria - Overview	EHSP
Project hazards identification approach PEMEL, Grid services/transport/industry (DK)	AIR LIQUIDE
Project hazards identification approach SOEL, Steel industry, (DE)	SUNFIRE
Project hazards identification approach hydrogen refuelling station(s)	ITM/ POWER
Project hazards identification approach PEMEL, 100bar Outlet Pressure	WHS/ 10AS ENERGY
Panel discussion - Moderated by the EHSP	
Session 3: Safety-related framework in electrolysis	
Regulations, Codes and Standards relevant to electrolysis - Overview	RCS SCG
Project safety approach ITM, Methanol production plant (NL)	NOURYON
Project safety approach ITM/ SHELL, 10 MW, PEMEL, Refinery (DE)	ITM/ SHELL
H2FUTURE project safety approach 6 MW, PEMEL, Steel manufacturing plant (AT)	SIEMENS/ VOESTALPINE
DEMO4GRID project safety approach 4 MW, Pressurized AEL, industrial bakery (AT)	MPREIS
MULTIPLYH project safety approach 2.6 MW, SOEL, Biodiesel refinery (NL)	WARENVERTRIEBS
17:10-17:30	Q&A/ Panel discussion - Moderated by the EHSP
17:30	Closing Remarks
	FCH 2 JU/ EHSP

2021

European Hydrogen Safety Panel
Task Force 1
Workshop Preparation
"Safe Storage of Hydrogen"
Thomas Jordan

ONLINE WORKSHOP
Safety at the hydrogen laboratory

Sharing best practices for safe layout and operation of laboratories with a significant inventory of hydrogen

An online webinar organised by the European Hydrogen Safety Panel (EHSP) and the Fuel Cells and Hydrogen 2 Joint Undertaking (FCH 2 JU), in cooperation with ...

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

Outcomes: Assessment and lessons learnt from HIAD 2.0

Products and Services of the EHSP



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

Statistics, lessons learnt and recommendations from analysis of HIAD 2.0 – Hydrogen Incidents and Accidents Database

20 October 2020

NOTICE

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4. STATISTICS

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5.1 Lessons learnt related to system design

5.2 Lessons learnt related to system manufacturing, installation and modification

5.3 Lessons learnt related to operator errors

5.3.1 Lessons learnt related to job factors

5.3.2 Lessons learnt related to individual/human factors

5.3.3 Lessons learnt related to organization and management factors

5.4 Lessons learnt for the first responders

5.5 Highlighted incidents with good lessons to be learnt related to cascading failure

6. RECOMMENDATIONS

6.1 Recommendations for different operational modes

6.2 Recommendations for different industry sectors

6.2.1 Hydrogen energy applications

6.2.2 Other industrial sectors

6.3 Other sectors

7. CONCLUDING REMARKS

ANNEX 1 SOURCE OF INFORMATION FOR HIAD 2.0

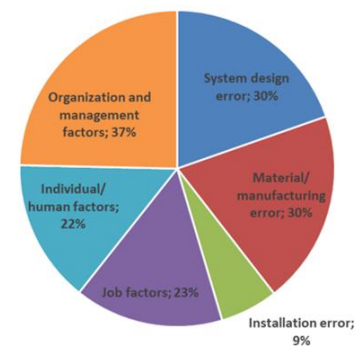


Figure 9: Causes of hydrogen incidents (multiple causes per event considered).

Table 1: HIAD 2.0 events classified by consequence and operation mode

Total number events	Number events by consequence			
	Explosions	Jet fires	Unignited hydrogen release	No hydrogen release
424	238	117	55	14
Total number events	Number events by operational mode			
	Normal operation	Outside normal operation	Unclear	
	299	113	12	

Table 2: HIAD 2.0 events classified by industry sector

Sector	Number of events by sector
Chemical/ Petrochemical industry	259
Hydrogen transport and distribution	43
Nuclear power plant	23
Laboratory / R&D	15
Power generation	13
Hydrogen production	10
Aerospace	5
Entertainment	3
Hydrogen-powered vehicle	2
Stationary fuel cell	0
Other/Unknown	34
Other	34
Total	461

Finally, Table 3 lists the number of events according to causes. It should be noted that some events had multiple causes.

Table 3: HIAD 2.0 events classified by causes

Cause	Number of events by causes
System design error	126
Material/ manufacturing error	127
Installation error	38
Job factors	98
Individual/ human factors	94
Organization and management factors	158



Outcomes: Support at Programme Level

Products and Services of the EHSP

Emergency Crisis Management // Collaboration: EHSP-USHSP // ICHS

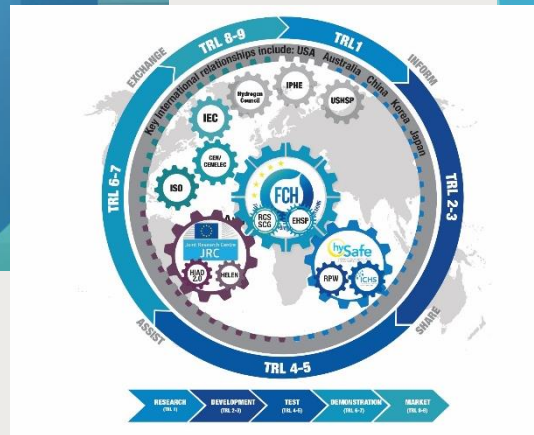


Emergency Crisis Management

Task 2 – Strategic Support

Emergency Crisis Management

Stuart Hawksworth



Collaboration: EHSP-USHSP

Hydrogen Safety Forum

Stuart Hawksworth & Chris LaFleur

Representing

European Hydrogen Safety Panel
&
United States Hydrogen Safety Panel

22 June 2021

ICHS

hySafe The Scottish Government and IA HySafe invite you to the unique

9th INTERNATIONAL CONFERENCE ON HYDROGEN SAFETY 2021

Safe Hydrogen for Net Zero

Edinburgh, 21-24 September 2021

ICHS 2021

hySafe INTERNATIONAL ASSOCIATION FOR HYDROGEN SAFETY

Scottish Government Rialtas na h-Alba gov.scot

Registration Open

<https://hysafe.info/ichs2021/>



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

Outcomes: Public Outreach

Products and Services of the EHSP

Communication Strategy // Website // FAQs // TIM // KEY MESSAGES



EHSP & FCH 2 JU CONFIDENTIAL

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

European Hydrogen Safety Panel (EHSP)

Communication strategy 2020–2024

24 April 2020

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FINAL DRAFT – EHSP & FCH 2 JU CONFIDENTIAL – EHSP Communication strategy 2020-2024

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



KEY MESSAGES

1. Hydrogen will play an essential role in energy systems as a clean and sustainable energy carrier.
2. To bring the benefits of hydrogen to society, hydrogen technologies must be safely developed and used across a variety of applications and sectors.
3. Hydrogen systems can be as safe as systems based on conventional energy carriers, provided the specific properties of hydrogen and the hydrogen system are properly addressed.
4. Hydrogen safety is an active area of research that supports the implementation and operation of hydrogen systems.
5. The EHSP provides impartial expertise and objective information to relevant stakeholders, including the public.
6. The EHSP supports stakeholders on issues related to hydrogen safety, including general advice, safety reviews, and accident investigations.
7. The EHSP supports and promotes the development of strong safety cultures in organisations engaged in hydrogen technologies.



The EHSP: An essential, open and free resource

Call for expression of interest open



The screenshot shows the FCH website header with the logo and navigation menu. The main content area is titled "CALL FOR EXPRESSION OF INTEREST" under the "EUROPEAN HYDROGEN SAFETY PANEL" section. The text includes a 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. It provides a hyperlink to the full call for expressions of interest and lists additional documents available for this call: Notice of call for expression of interest – publication number 2017/S 17-408163, Legal entity templates, Financial identification, Registration Form, and Privacy statement. Instructions for applications are also provided, stating that 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!**



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