Clean Hydrogen Partnership

European Hydrogen Safety Panel (EHSP)
Webinar "Safety planning and management in EU hydrogen and fuel cell projects“, 22 April 2022

EUROPEAN HYDROGEN SAFETY PANEL (EHSP)

Iñaki Azkarate, PhD
European Hydrogen Safety Panel (EHSP)

EUROPEAN PARTNERSHIP

Co-funded by the European Union

Background

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 **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

The Panel. Current Members

Group of experts in Hydrogen Safety constituted by 15 members


Iñaki 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

KNOWLEDGE HUB

Co-funded by the European Union

EHSP Role

to **provide** the Clean Hydrogen JU

- **independent safety expertise**
- **objective information**
- **education and training**

in different forms for various groups of stakeholders and support the upscaling of hydrogen energy

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Mission, Objectives and Activities

The EHSP assists the Clean Hydrogen JU both at programme and at project level in

- **assuring that hydrogen safety is adequately managed**, and
- **promoting and disseminating hydrogen safety culture**

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Activities

Activities are grouped in 4 pillars and organised in Task Forces (TF)

- **TF1 Support at Project level**
- **TF2 Support at Programme level**
- **TF3 Data collection and assessment**
- **TF4 Public Outreach**

Elena Vyazmina

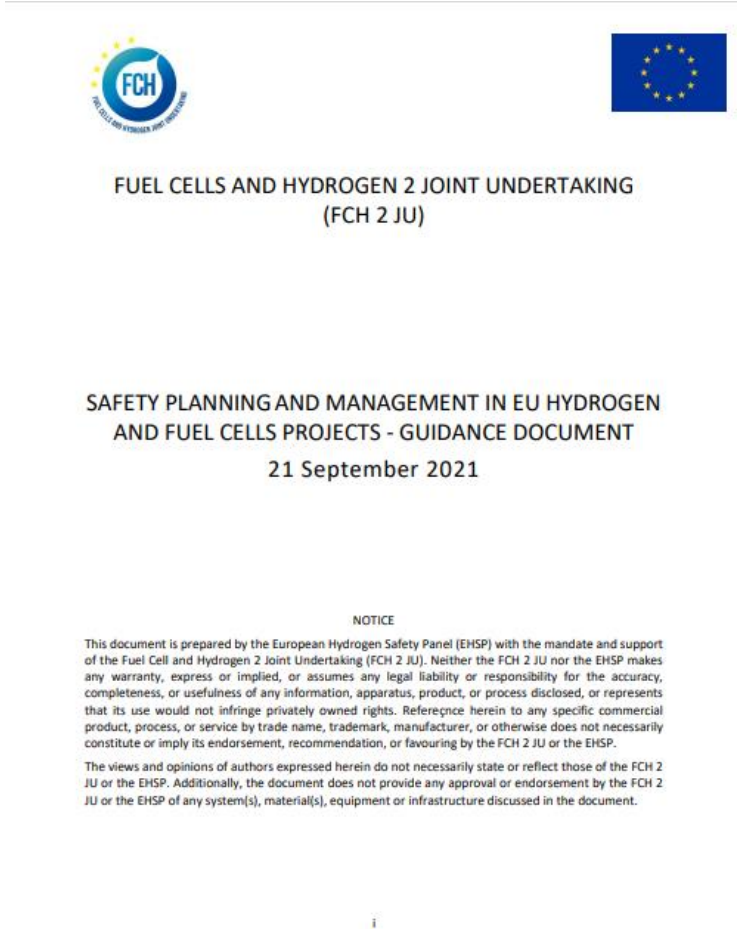
Thomas Jordan

Jennifer Wen

Trygve Skjold

Outcomes: Safety Planning Guidance Document

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



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

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

21 September 2021

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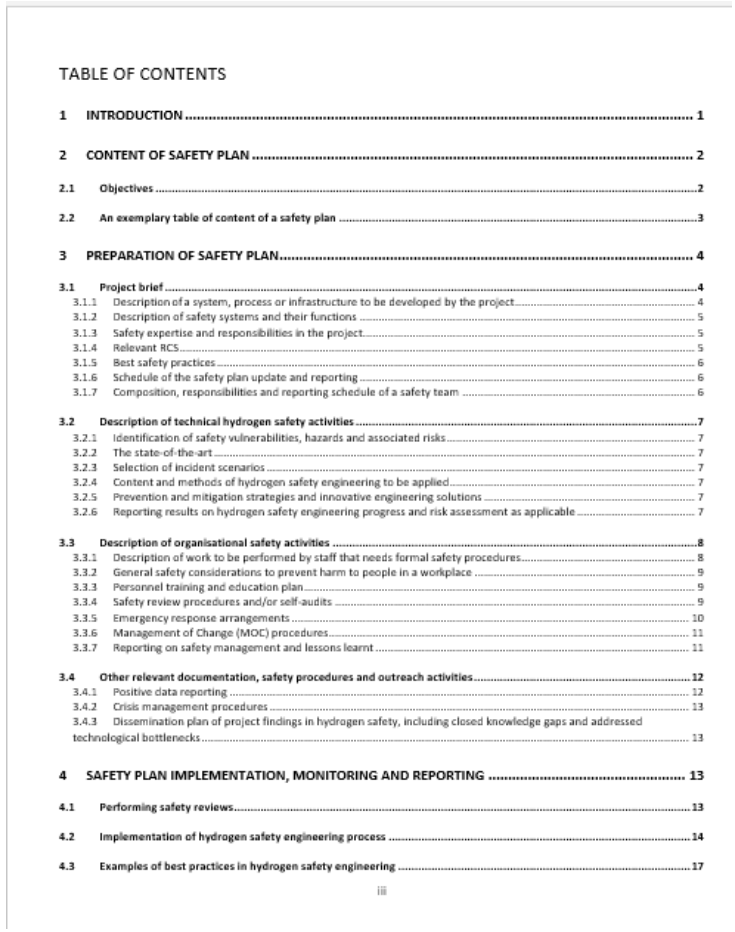

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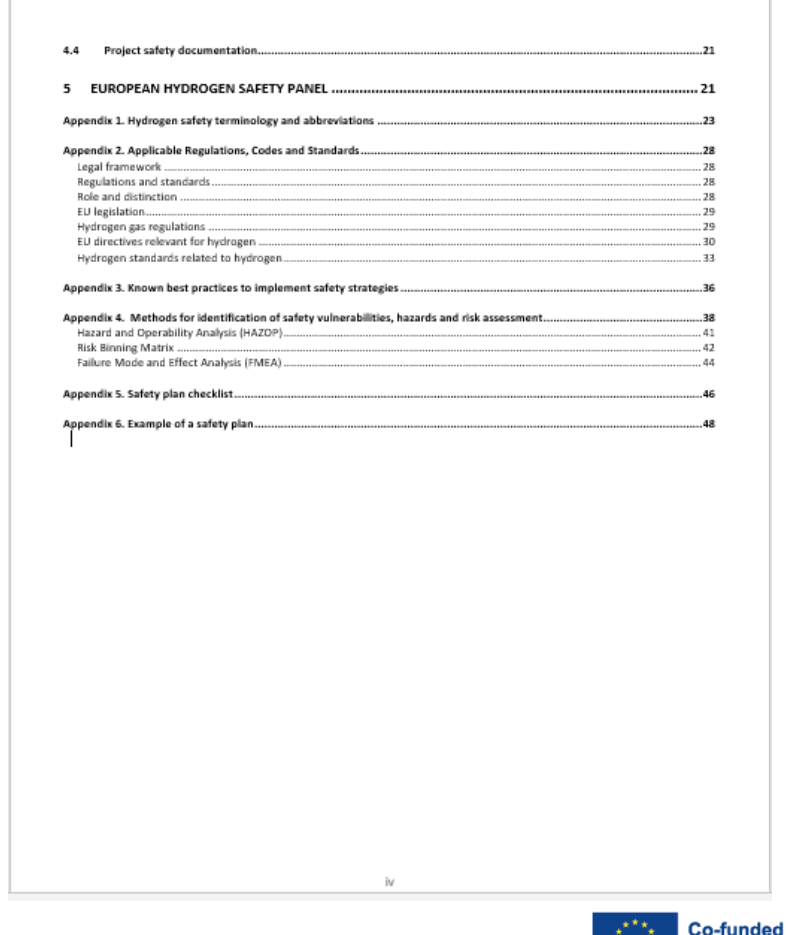

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Outcomes: Workshops

Safety of Electrolysis

2020

FCH JU Workshop on Safety of Electrolysis

AGENDA

	Welcome Remarks	FCH JU
	European Hydrogen Safety Panel (EHSP)	EHSP
	Session 1: Safety-related events and lessons learnt	
	Hydrogen Incidents and Accidents Database (HIAD 2.0) Findings, lessons learnt, recommendations	DG JRC - EC
	Case Studies - Ilford and Gangneung in South Korea History, lessons learnt	EHSP
	Q&A/ Panel discussion - Moderated by the EHSP	
	Session 2: Hazards identification for electrolysis	
	Set of prototypical hazards, Risk Evaluation and Acceptance Criteria - Overview	EHSP
	HYBALANCE project hazards identification approach 1.2 MW, PEMEL, Grid services/transport/industry (DK)	AIR LIQUIDE
	GRINHY2.0 project hazards identification approach 700+ kW, SOEL, Steel industry, (DE)	SUNFIRE
	H2ME2 project hazards identification approach PEMEL, Hydrogen refuelling station(s)	ITM POWER
	PRETZEL project hazards identification approach 25 kW, PEMEL, 100bar Outlet Pressure	WHS/ iGAS ENERGY
	Q&A/ Panel discussion - Moderated by the EHSP	
	Session 3: Safety-related framework in electrolysis	
16:10-16:20	Safety in Regulations, Codes and Standards relevant to electrolysis - Overview	RCS SCG
16:20-16:30	DJEWELS project safety approach 20 MW, AEL, Methanol production plant (NL)	NOURYON
16:30-16:40	REFHYNE project safety approach 10 MW, PEMEL, Refinery (DE)	ITM/ SHELL
16:40-16:50	H2FUTURE project safety approach 6 MW, PEMEL, Steel manufacturing plant (AT)	SIEMENS/ VOESTALPINE
16:50-17:00	DEMO4GRID project safety approach 4 MW, Pressurized AEL, Industrial bakery (AT)	MPREIS WARENVERTRIEBS
17:00-17:10	MULTIPLHY project safety approach 2.6 MW, SOEL, Biodiesel refinery (NL)	SUNFIRE
17:10-17:30	Q&A/ Panel discussion - Moderated by the EHSP	
17:30	Closing Remarks	FCH 2 JU/ EHSP

Safe Storage of Hydrogen

2021

ROGEN

sed Gas Hydrogen in road transport
nfrastructure

		FCH 2 JU
		FCH 2 JU
	?)	EHSP
	h hydrogen storage	
	dards ew	JRC
	nts involving	EHSP
		EHSP
	e (CGH2) - On-board storage	
	derations	EHSP
		BMW
		CLEAN ENERGY PARTNERSHIP
10:30-10:40	H2HAUL project - Heavy-duty vehicles	VDL
10:40-10:50	REVIVE project - Heavy-duty vehicles	ALL ENGINEERING
10:50-11:00	THOR project - CGH2 Tanks	FAURECIA
11:00-11:10	HYTUNNEL-CS project - Safe design of TPRD/ TPRD-free tanks	UNIVERSITY OF ULSTER
11:10-11:40	Q&A/ Panel discussion	EHSP
11:40-11:45	Break/ contingency time	

GEN

t in supply infrastructure	
	EHSP
	ITM POWER
	EIFER
	AIR LIQUIDE
	KARLSRUHE INSTITUTE OF TECHNOLOGY
	EHSP
	FCH 2 JU/ EHSP

Fuel Cells and Hydrogen Joint Undertaking
WA TO 56, 1049 Brussels, BE

www.fch.europa.eu
fch-ju@fch.europa.eu

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Outcomes: Assessment and lessons learnt from HIAD 2.0

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

Statistics, lessons learnt and recommendations from the analysis of the Hydrogen Incidents and Accidents Database (HIAD 2.0)

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Figure 1: Flow chart of the process from data collection to final publishing and dissemination.

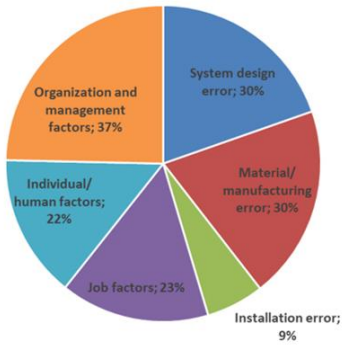


Figure 9: Causes of hydrogen incidents (multiple causes per event considered).

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

	Number events by consequence			
Total number events	Explosions	Jet fires	Unignited hydrogen release	No hydrogen release
424	238	117	55	14
	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	
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.

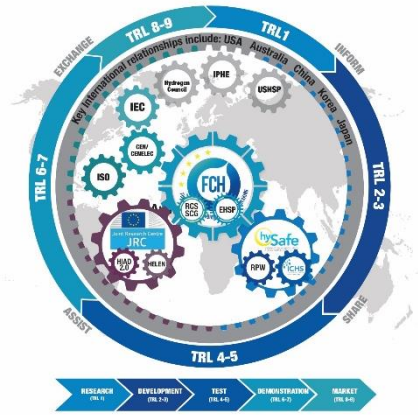
Table 3: HIAD 2.0 events classified by causes

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

"Statistics, lessons learned and recommendations from analysis of HIAD 2.0 database" will appear soon in International Journal of Hydrogen Energy

Outcomes: Support at Programme Level

Emergency Crisis Management



Collaboration: EHSP-USHSP

ICHS

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Outcomes: Public Outreach

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

Key Messages

- Hydrogen will play an essential role in energy systems as a clean and sustainable energy carrier.
- To bring the benefits of hydrogen to society, hydrogen technologies must be safely developed and used across a variety of applications and sectors.
- 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.
- Hydrogen safety is an active area of research that supports the implementation and operation of hydrogen systems.
- The EHSP provides impartial expertise and objective information to relevant stakeholders, including the public.
- The EHSP supports stakeholders on issues related to hydrogen safety, including general advice, safety reviews, and accident investigations.
- The EHSP supports and promotes the development of strong safety cultures in organisations engaged in hydrogen technologies.

https://www.timanalytics.eu/TimTechPublic/main.jsp?dataset=s_1622

https://www.clean-hydrogen.europa.eu/get-involved/european-hydrogen-safety-panel-0_en

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Thank you

Get in contact with the EHSP by email at
EHSP@clean-hydrogen.europa.eu

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