Major Accident Hazards Bureau (MAHB) General work programme and hydrogen fuel risks

Maureen Wood
Major Accident Hazards Bureau
European Commission Joint Research Centre (EC-JRC)

Outline of the presentation

- Who we are
- The EU Seveso Directive for control of major chemical hazards
- The work of MAHB
- Alternative energy risks

Science for policy

ANTICIPATE

INTEGRATE

IMPACT

Our purpose

The Joint Research Centre provides independent, evidence-based knowledge and science, supporting EU policies to positively impact society.

European Commission

The Major Accident Hazards Bureau (MAHB)

The **Major Accident Hazards Bureau (MAHB)** is an office within the **European Commission's Joint Research Centre (EC-JRC)**. We provide scientific and technical support for policy to **enhance chemical safety and security across the EU.**

We work with European Union (EU) policy entities within the EC, **(ENV)) and Member States,** to implement the **EU Seveso Directive** for the control of major chemical accident hazards

We work with EU policy leaders in the area of disaster risk reduction and crisis management **to support impact analysis** (**ECHO**), **crossborder health risk** (**SANTE)**, capacity building for **CBRN risk management** in EU Neighbourhood countries and third countries **(FPI, NEAR)**

We support understanding emerging risks related to **alternative energies, including leadership of the EU+OECD hydrogen fuel risks webinar series (ENER)**

We **represent EU experience and knowledge** to **international organisations the OECD Working Party on Chemical Accidents and the UNECE Convention on Transboundary Risks**

We manage EC obligations to collect and analyse EU Member State **data on chemical accidents for lessons learning and emerging trends**

For more information, visit
https://minerva.jrc.ec.europa.eu/en/minerva

European Commission

The Seveso chemical disaster – 10 July 1976

This disaster resulted in the highest known exposure to 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) in a residential population

It launched the EU's role as a leader in chemical accident prevention and preparedness

The Major Accident Hazards Bureau and the Seveso Directive were both born out of this tragic event.

European Commission

The EU Seveso Directive at the core of MAHB work

- The first comprehensive chemical accident risk management legislation in the world, authorized in 1982.
- Revised several times, most substantially in 1996 (Seveso II), but also after the Baia Mare, Romania (1999), Enschede, Netherlands (2000) and Toulouse, France (2001) disasters
- A performance-based system – It requires safety management system, rigorous system of inspections, accident investigation, accident reporting for sharing lessons learned,
- It Is a global model for chemical accident risk management world wide
  - The OECD Guiding Principles on Chemical Accident Prevention and Preparedness is heavily influenced by the EU Seveso Directive
  - The UNECE Convention on Transboundary Effects of Industrial Accidents is modeled after the
- The JRC-MAHB work is based on the experiences of the EU in implementing the Seveso Directive

Seveso – A lasting legacy - protecting citizens and the environment

The Seveso Directive is 43 years old.

Its legacy has now passed on to a third generation of inspectors, emergency responders, land-use planners, lawyers and policy makers.

<u>It has been a phenomenal success.</u>

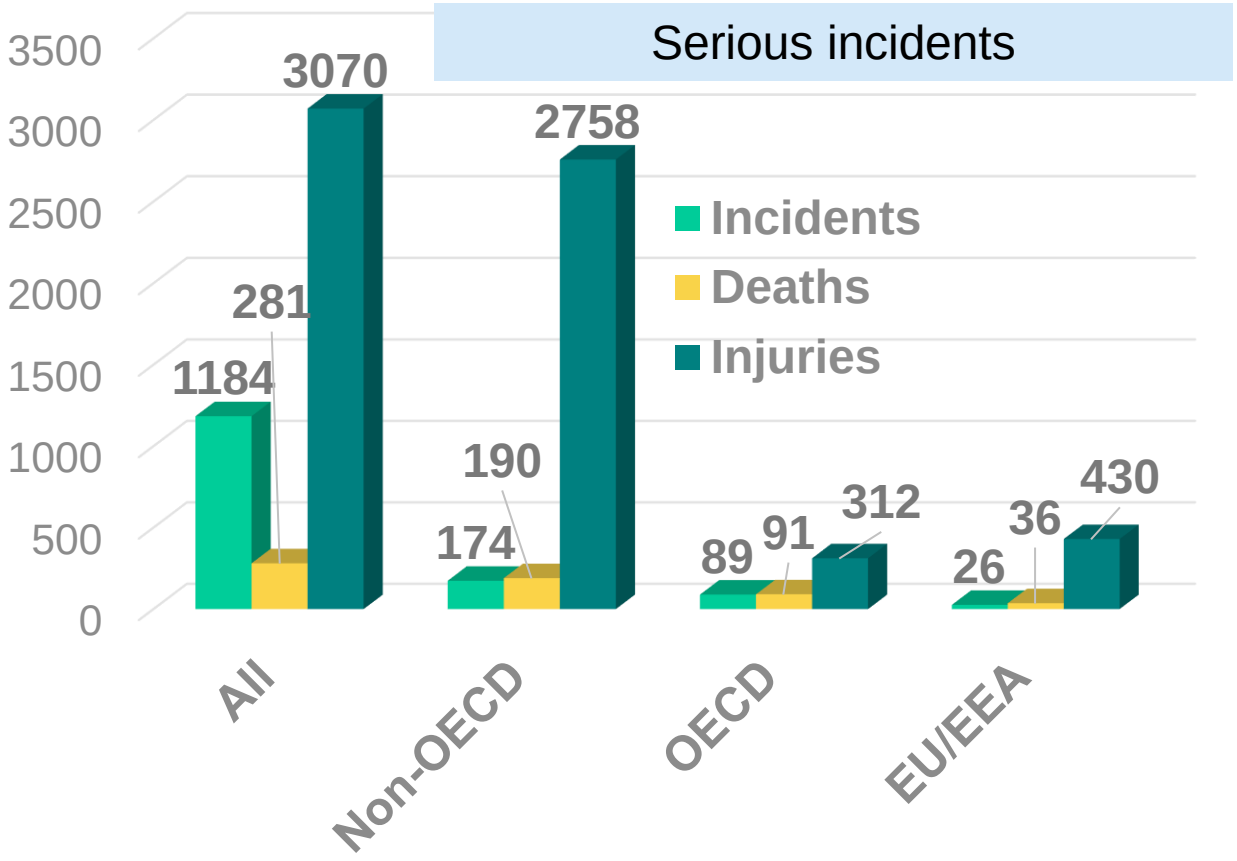
In the EU, serious chemical incidents do not rise as the economy grows.

From 2010, Seveso establishments increased by 20% from almost 10,000 to nearly 12,000

In 2010, there were 38 major accidents reported vs. 21 in 2020.

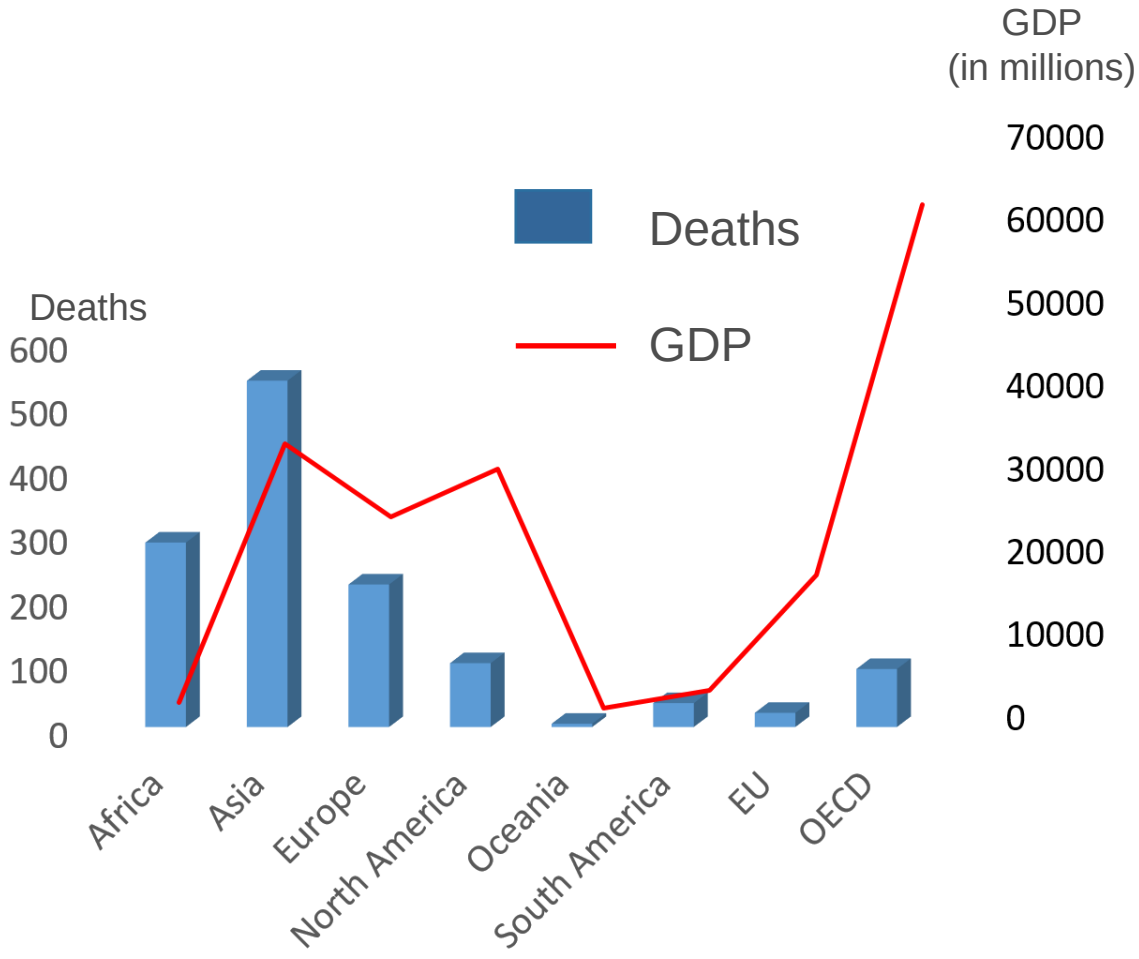
Moreover, the Seveso culture tends to lift all industry safety to a higher level

Annual analysis of chemical incidents as reported in the global media in 2023



By number of incidents, deaths and injuries (2023)

Number of deaths from chemical incidents vs. GDP (2023)

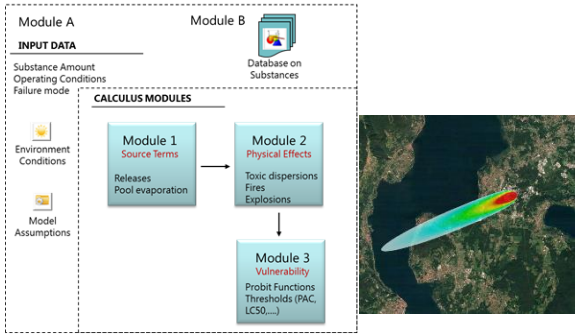


Sources: JRC GMI-Chem database, International Monetary Fund

European Commission

MAHB Areas of Work

Consequence and risk analysis



ADAM software – Version 3.0

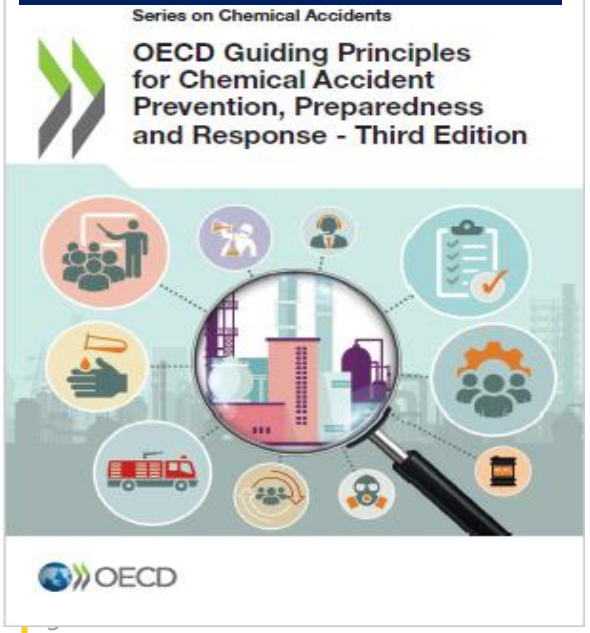
Good practice exchange/Capacity building

Publications

- Common Inspection Criteria
- Inspection Good Practice Seveso Guidance
- Lessons learned studies Chemical accident scenarios
- Other resources

Seveso inspector portal

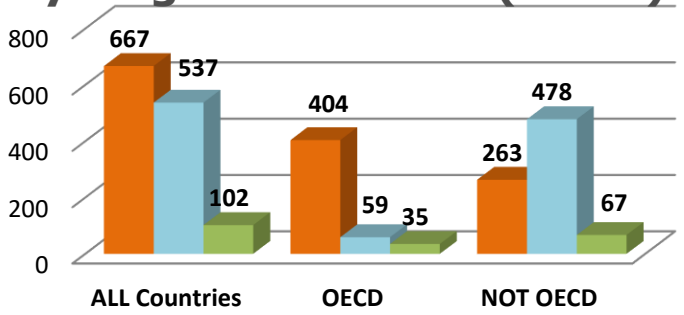
International Collaboration



Chemical incident data – Trend analysis & lessons learned

CAPRI Data collections

- Worldwide disasters
- Historic accidents,
- Global media database
- Hydrogen accidents (HIAD)



Alternative energies/emerging risks

Lessons learned – Hazardous waste

EU+OECD Hydrogen Fuel Risks Webinars

JRC MAHB recent and upcoming publications and products

- Learning from incidents in waste management facilities, LLB (published)
- Learning from ammonia incidents, LLB (upcoming)
- Handbook for Investigating and Learning Lessons from Chemical Incidents (upcoming)

- Common Inspection Criteria
  - Avoiding ignition sources (published)
  - Toxic dispersion events (published)
  - Secondary containment systems: Bunds, dykes, berms
  - Power supply, utilities and blackouts (upcoming)
  - Incident investigation (upcoming)
  - Warehouses (upcoming)
  - Underground gas storage (upcoming)

All MAHB publications are available at:
https://minerva.jrc.ec.europa.eu/en/minerva

Alternative energy risks

First four webinars of the EU + OECD hydrogen fuel webinar series

Date	15 September 2023 (Webinar 1)	14 February 2024 (Webinar 2)	8 October 2024	14 February 2-25
Participants	60+ from 24 EU-OECD countries invitation only	198 from 23 EU countries, 28 OECD + 4 regulators only	400+ participants – 32 countries, open registration	~300 participants, 35 countries, open registration
Purpose	Risk implications of expanded hydrogen fuel use	Elaboration of webinar 1 to address hydrogen fuel risks	Industry perceptions of challenges and initiatives to address	Exchange with EU energy policy + ammonia risks
Focus	Different country projections for hydrogen fuel infrastructures	Safety challenges for regulators in hydrogen fuel applications	Gaps in industry technical and safety standards, outlook for filling those gaps,	Exchange with policy, initiatives to ensure safety with large NH^3 storage
Goal	Scope of new infrastructure planned for new hydrogen fuel uses	Issues with government role in assuring safety of hydrogen fuel operations	priorities and timeline for addressing new technical and safety needs of hydrogen fuel operations	Engagement of policy makers, sharing of new NH3 safety and storage standards

Highlights from the webinars

Focus on exchange – Led by regulators, involving industry and policymakers

KEY MESSAGES

Consolidation of information on gaps and challenges in relation to:

- Regulator challenges
- Safety and risk challenges
- Site risk management challenges
- Collaboration and knowledge sharing challenges

Traditional hazardous industries (Refineries, industrial gases) are working to address challenges

Policymakers need to take a more active role in making it work

Regulator challenges

Criteria for permitting, land-use planning

Competency of “new” authorities

Gaps in standards and risk management norms

Gaps in regulatory framework (regional and local)

Emergency preparedness and response

Inspection protocols

Safety and risk challenges

Unique properties of hydrogen

Gaps in consequence and risk modeling

Risk assessment uncertainties

Hydrogen methane blends

Decision making tools

Oversight and monitoring

Site risk management challenges

Safety equipment and inspection	Material compatibility	Identifying overpressure situations
Gas detection limitations	Variability in shutdown capabilities	Inspection and maintenance gaps

Help from science to make risk management decisions

The biggest challenge
Collaboration and knowledge sharing challenges

Knowledge sharing across industry, government, science

Creating and updating standards

Engaging new stakeholders

Outreach to policymakers, local government, media

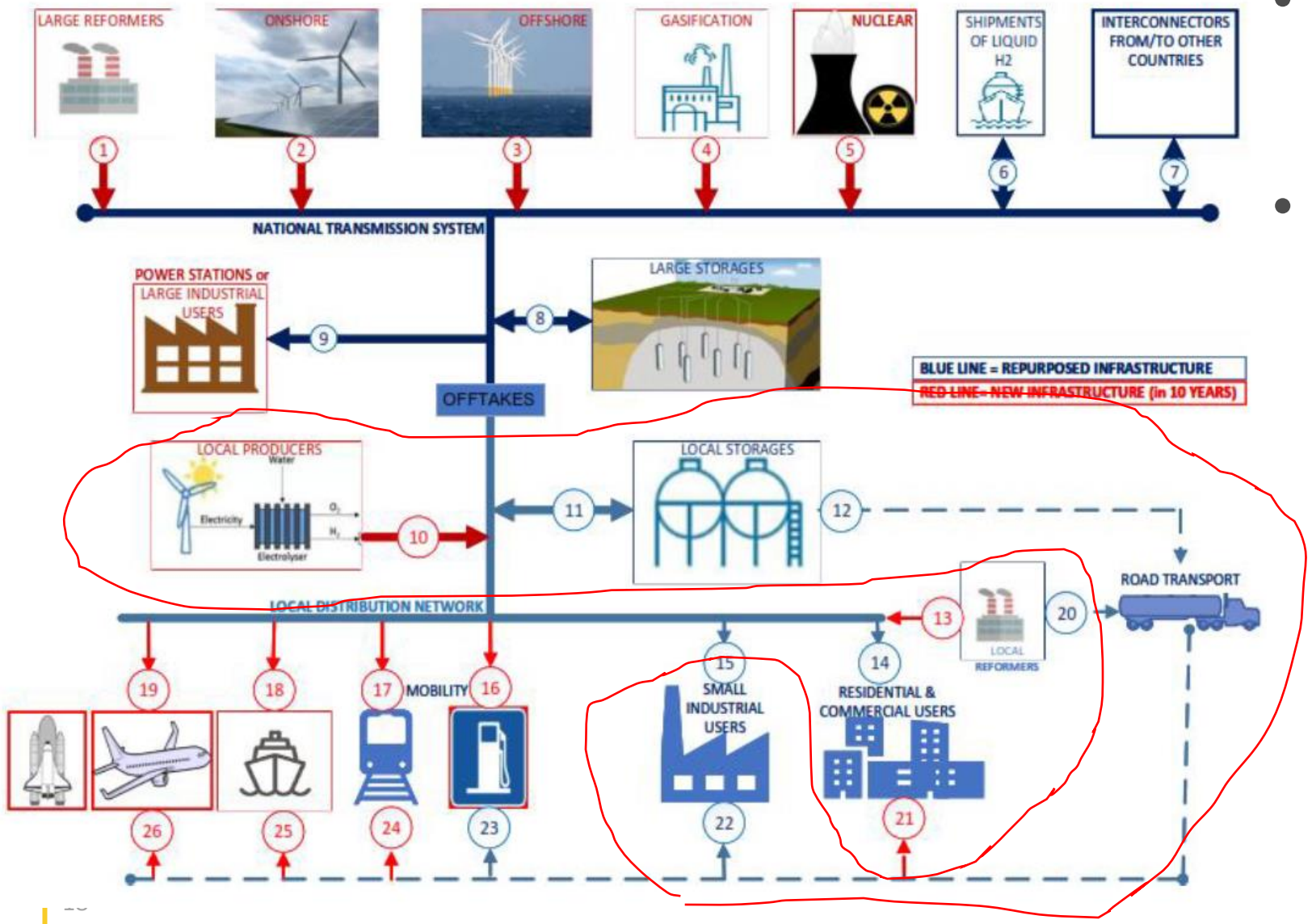
Preserving and building knowledge

Getting the actors in touch with the knowledge they need

Simple hydrogen value chain – simpler local cluster

Technical + Innovation

Courtesy of The Energy Institute



- **Phase 1** ‘General Interface Assessment’ identified issues around custody transfer compared to NG network operation
- **Phase 2a** (2025): Technology Maturity & Service Supply Chain Summary: Investigate key areas of weakness in elements of technology and service interfaces, e.g. infrastructural technology/ hardware related services, isolation systems, pressure reducing systems with overpressure protection, leak detection/gas detectors, etc.

! Knowledge gaps with some safety systems

Understanding and addressing technical challenges for the deployment of a hydrogen economy

For the full presentation, see EU+OECD HFR Webinar 3

Courtesy of The Energy Institute

2025 *provisional* programme includes:

- Continuing to undertake research on large scale storage of H2 (and LOHCs).
- Developing guidance on the management of corrosion and wider asset integrity management of facilities handling hydrogen.
- Literature review of requirements for the design and construction of road tankers for the transport of GH2 and LH2 and NH3
- H2 Information Management Portal – Phase 1: Legislation, Regulations and Standards module
- Transition technologies (including H2) animation
- Evaluating the energy balance and efficiency of a whole hydrogen-derivative energy system, from production to consumption
- Infrastructure Integration – Phase 2 Technology Maturity Assessment for H2 and H2/NG blends, e.g. infrastructural technology/ hardware related services, isolation systems, pressure reducing systems with overpressure protection, leak detection/gas detectors, etc.
- NH3 process safety from production to end use in the emerging NH3 energy economy
- Process safety challenges in managing change when introducing low carbon technologies (including H2) to existing facilities

Road tankers

LCA

NH3 PS

PS MoC

Information management

Corrosion management

Stakeholder 'explainer'

Infrastructure integration

European Commission

Conclusions

- **The unknowns about hydrogen fuel risks are not the most significant barrier** to the roll-out of hydrogen fuel projects
  - Hazardous industries and government experts have approaches to dealing with risk uncertainty
  - The more significant safety challenges is limited competence and awareness of new actors

- **It will take some years to achieve sufficient alignment of standards and norms** to address new safety and technical needs of the hydrogen value chain
  - Deadlines for hydrogen fuel capacity in different countries may need to adjust to address that reality.

- **National policymakers may need to engage more deeply with industry in planning the infrastructure** to support hydrogen fuel distribution, e.g., grid space, pipelines, distribution networks, crossborder connections
  - It could be a good use of time while standards alignment is taking place.

Next steps

OECD project for 2025-2028

Key safety considerations document for energy transition technology, focusing on risks from new uses of hydrogen and on the risks from ammonia as an energy vector

- Bring awareness to the need for safety considerations during the energy transition, targeting in particular decision-makers in public authorities and industry.
- Safety considerations corelated, where appropriate, to the associated regulations and how well they apply under a new risk profile or to the potential lack of regulations for some aspects.

Continuation of the joint EU/OECD webinar series on hydrogen fuel risk and extension to safety considerations for other energy transition technology.

Thank you

European Commission