Insights from the second Webinar

Managing new hydrogen fuel risks

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Third Hydrogen Fuel Risks Webinar
DG JRC Major Accident Hazards Bureau and OECD
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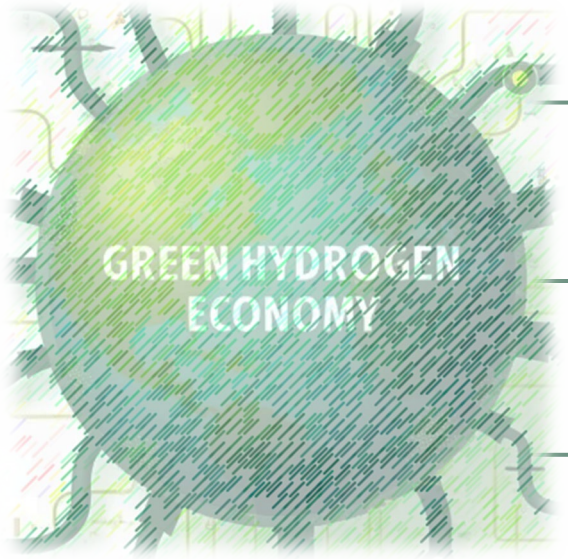
Objectives



- Introducing webinar focus
- Identifying key challenges
- Illustrating conlusions and next steps

Overview hydrogen fuel risks Webinars

Date	15 September 2023 (Webinar 1)	14 February 2024 (Webinar 2)
Organized by	European Union Joint Research Centre (EU JRC) and Organisation for Economic Co-operation and Development (OECD)	European Union Joint Research Centre (EU JRC) and Organisation for Economic Co-operation and Development (OECD)
Participants	60+ from 24 EU and OECD countries	198 from 23 EU countries, 28 OECD countries, and four additional countries (Argentina, Kenya, Moldova, Philippines, Singapore)
Purpose	To discuss potential risk implications of expanded hydrogen fuel use	Build upon discussions from Webinar 1 to address hydrogen fuel risks
Focus	Defining hydrogen risk challenges and identifying necessary tools and structures	Safety challenges in hydrogen applications and integration into energy transition
Goal	Enhance understanding of hydrogen risks and improve safety measures	Inform OECD's Working Party on Chemical Accidents for the next four years
Stakeholders	EU and OECD inspectorates, hydrogen specialists, scientific organizations	Authorities, research institutes, and industry experts

Focus areas in Webinar 2

Goals

- Inform and shape the OECD's Working Party on Chemical Accidents' work over the next four years.
- Address risk and safety challenges posed by the rapid development of hydrogen applications and technologies and their use.
- Incorporate findings into energy transition and green energy development strategies.

Focus

- Technical regulatory frameworks and standards.
- Risk assessment methodologies
- Inspections and safety measures.
- Current hydrogen fuel development of applications and technologies.
- Practical experiences from ongoing hydrogen projects
- Communication
- Exchange insights on ongoing safety efforts
- Importance of conveying safety challenges beyond the process safety community

Regulatory challenges

- **Inconsistent international regulations:** divergent hydrogen fuel regulations impede global expansion and hinder economies of scale.
- **Lack of national safety frameworks:** absence of specific hydrogen laws complicates safety compliance; existing chemical regulations may inadequate for hydrogen projects.
- **Oversight confusion:** Varying safety requirements at different governance levels create compliance difficulties and inconsistent safety expectations for operators.
- **Need for enhanced coordination:** clear responsibilities and collaboration among regulatory bodies are essential to avoid mixed messages in safety management.
- **Alignment with technological advancements:** rapid developments in hydrogen technology require timely regulatory updates for safety and effective implementation.
- **Translating science into guidelines:** regulations should focus material safety and risk assessments for hydrogen system components.
- **Clear guidance for operators:** the multitude of evolving rules can overwhelm operators, especially newcomers, highlighting the need for coherent and consistent regulatory guidance
- **Clear operator guidance:** evolving regulations can overwhelm operators, particularly newcomers, emphasizing the need for coherent guidance.

Safety and risk challenges

- **Unique properties of hydrogen:** high diffusivity, wide flammability range, and invisible flames create significant safety management challenges for new users.
- **Risk assessment needs:** understanding ignition risks and dispersion is essential; comprehensive risk assessment methods must include qualitative evaluations and community impact.
- **Reducing uncertainty:** minimizing variability in risk assessment models is crucial for establishing trust and informed safety decisions.
- **Adapting decision-making tools:** emergency preparedness and permitting processes must consider hydrogen-specific risks; existing regulations may not adequately address these.
- **Research on hydrogen-methane blends:** prioritize addressing challenges of blending hydrogen with methane in pipelines; update technical regulations to reflect increased hydrogen content.
- **Developing national strategies:** national frameworks must address new exposure risks as hydrogen use grows in public spaces; anticipating barriers is key for project success.
- **Enhanced oversight for operations:** increased regulatory scrutiny of active hydrogen operations is necessary, focusing on safety measures, maintenance inconsistencies, and regular risk analyses.

Challenges in emergency response for hydrogen facilities

- **Safety equipment and inspection:** effectiveness of safety equipment and inspection protocols for emergency preparedness needs improvement.
- **Material compatibility:** ensuring material compatibility is critical for safe operations in hydrogen facilities.
- **Identifying overpressure situations:** difficulty in recognizing potential overpressure situations complicates emergency preparedness.
- **Gas detection limitations:** the colourless nature of hydrogen flames makes leak and fire detection challenging, hindering timely emergency responses.
- **Variability in shutdown capabilities:** inconsistent emergency shutdown systems across different setups (e.g., hydrogen tube trailers) can impede response efforts.
- **Inspection and maintenance gaps: i**dentified deficiencies in inspection and maintenance of safety valves and pressure relief systems increase overpressure risks and reduce detection efficiency in enclosed areas.

Collaboration and knowledge sharing challenges

- **Importance of collaboration:** foster knowledge exchange among regulatory bodies, industry associations, and safety organizations to enhance hydrogen safety.
- **Creating standards:** clear safety guidelines require collaboration between regulatory agencies and experienced industries, particularly in chemical and petroleum refining.
- **Engaging new stakeholders:** actively involve newcomers in the hydrogen market, such as equipment designers and storage builders, while connecting them with experienced experts for ongoing learning..
- **Broadening communication:** improve outreach about hydrogen risks and safety measures to national policymakers, media, and local governments to enhance awareness and understanding.
- **Knowledge preservation:** transmit hydrogen safety knowledge and best practices across public and private sectors; utilize open-source databases and online resources for easy access to information.

Research and innovation challenges in hydrogen safety

- **Research and standards development:** extensive research is vital for establishing standards for materials suitable for hydrogen applications.
- **Material compatibility concerns:** certain metals may become brittle when exposed to hydrogen, posing safety risks in pipelines and storage systems.
- **Advancements in detection technologies:** there is a critical need for improved technologies to effectively detect hydrogen leaks and hazards, ensuring safety in hydrogen systems.
- **Strengthening safety measures:** Current safety protocols, emergency response plans, and risk management practices need enhancement to ensure the reliability of hydrogen systems.

Practical examples in hydrogen fuel safety

- **Transporting hydrogen-methane mixtures:** current pipelines can only handle up to 2% hydrogen with ongoing blending tests up to 5% and 10% in natural gas networks.
- **Hydrogen refuelling stations:** standardized connections are needed to prevent refueling errors, alongside clear identification systems for equipment; development of guidebooks and updated legislation is essential for safety practices.
- **Small electrolysers in residential areas:** existing regulations may not address the new safety and technical challenges posed by these units, necessitating case-by-case risk evaluations.
- **Land-use planning for hydrogen facilities:** need for simplified and standardized land-use planning approaches.
- **Findings from inspection campaigns:** identified inconsistencies in safety measures across hydrogen sites highlight challenges in ensuring compliance, particularly for third-party installations.

Conclusions from the Webinar 2

Addressing technical and operational challenges	*Focus on improving safety valves, emergency shutdown systems, inspection programs, and emergency response protocols.*
Importance of regular inspections and maintenance	*Essential for preventing leaks, ensuring safety in enclosed spaces, and managing pressure effectively.*
Safe practices for hydrogen transport	*Emphasize correct identification of hydrogen trailers, adequate gas detection systems, and comprehensive emergency plans.*
Ongoing research and development	*Need for studies on hydrogen behaviour, new materials, detection technologies, and safety best practices.*
Developing comprehensive guidelines and standards	*Collaborate with stakeholders to create adaptable guidelines for emerging technologies.*
Updating risk assessment methods	*Focus on hydrogen-specific scenarios and establish safety distances and planning protocols.*
Enhancing collaboration for knowledge sharing	*Foster partnerships among regulatory bodies, industry, research institutions, and both experienced operators and newcomers.*
Implementing education and training programs on hydrogen safety	*Provide training for operators, emergency responders, and inspectors on hydrogen safety practices.*

Thank you

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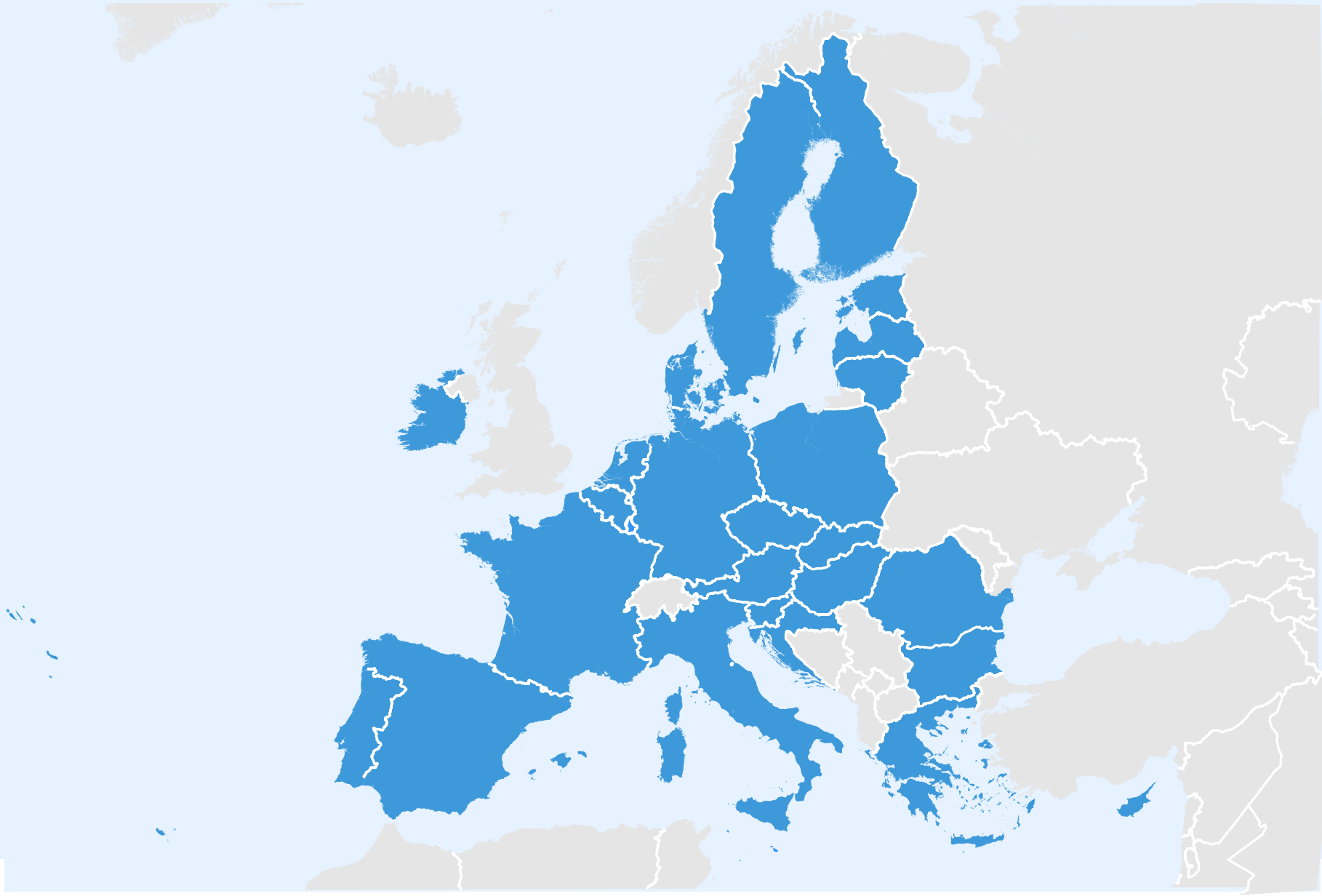

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