D7.3– Networking activities

WP 7–Normative Framework

Task 7.3 Networking activities

Author	Beatriz Nieto Calderón, CNH2 Esteban Rodriguez Muñoz, CNH2
Phone number, E-mail	ERM: +34 926420682 – 155, Ej.rodriguez@cnh2.es BNC: +34 926420682 – 150, Beatriz.nieto@cnh2.es
Date	28/11/2024
Document ID	FCH2RAIL-823879026-407
Document Status	X Draft prepared for final review within task / WP
	X Finalised draft document at Task / WP level
	X Document after quality check
	X Document approved by SC
	X Document approved by TMT
	X Document submitted to FCH-JU

Dissemination Level	
PU: Public	**X**
CO: Confidential, only for members of the consortium (including the Commission Services):	

Clean Hydrogen Partnership
Co-funded by the European Union

Document Status History

Status Description	Date	Partner	Status Code in Filename
Draft prepared for final review within task	15.11.2024	Esteban Rodriguez, Beatriz Nieto, CNH2	Draft_final_review_task
Finalized draft document at WP level	02/12/2024	Esteban Rodríguez, Beatriz Nieto, CNH2	WP_final_draft
Document after quality check	12/12/2024	Stefanie Schöne, DLR	QC
Document approved by SC	10/01/2025	SC	Approved_SC
Document approved by TMT	10/01/2025	TMT	Approved_TMT
Document submitted to FCH-JU	14/01/2025	Maike Vogt, DLR	Submitted

Contributions Table

Partner	Contribution
CNH2	Preparation of the deliverable and networking activities
CAF	Networking activities and contribution to the deliverable
DLR	Networking activities and contribution to the deliverable
ADIF	Networking activities and contribution to the deliverable
RENFE	Review of the deliverable
IP	Review of the deliverable
STT	Review of the deliverable

This project has received funding from the Fuel Cells and Hydrogen 2 Joint Undertaking (now Clean Hydrogen Partnership) under Grant Agreement No. 101006633. This Joint Undertaking receives support from the European Union's Horizon 2020 Research and Innovation program, Hydrogen Europe and Hydrogen Europe Research.

Clean Hydrogen Partnership
Co-funded by the European Union

Executive Summary

This document is Deliverable D7.3: “Networking activities”, for the project ‘FCH2RAIL: Fuel cell hybrid power pack for rail applications’, under Grant Agreement No. 101006633[1].

The lack of legal protection and the uncertainty in approval processes are significant barriers to implementing new technologies. These regulations are intended to protect, guarantee, and facilitate implementation, yet their absence affects manufacturers, operators, and infrastructure managers. Consequently, one of the main challenges of the FCH2RAIL project has been the identification of the gaps in the regulatory framework concerning operational and administrative procedures.

This document provides a detailed report on the various networking activities related to the normative framework. It summarises the networking activities implemented by the project members in order to liaise with relevant bodies and stakeholders and to provide the information developed by the project consortium. It also suggests the next steps to be taken as a result of the project's work. This effort aims to facilitate progress in modifying the normative framework at a later stage.

Clean Hydrogen Partnership
Co-funded by the European Union

Glossary of Terms

Abbreviations	Description
LGA	Legislative Gap Analysis
HRS	Hydrogen Refuelling Station
RCS	Regulations, Codes and Standards
FCH2RAIL	Fuel Cell Hybrid PowerPack for Rail Applications
H2	Hydrogen
SEP	Stakeholder engagement plan
TSI	Technical Specification for Interoperability
ERA	European Railway Agency
FCS	Fuel Cell System
NSA	National Safety Authority
WP	Work Package

Acronyms	Description
CA	Consortium Agreement
GA	Grant Agreement
RSSB	Railway Safety & Standards Board

Clean Hydrogen Partnership
Co-funded by the European Union

Contents

Clean Hydrogen Partnership
Co-funded by the European Union

1. Background information

The work developed in previous WP7 tasks is the basis to propose a new collaborative framework in the use of fuel-cell based propulsion systems in the railway sector between the relevant stakeholders. As part of WP7 a Stakeholder Engagement Plan (SEP) was created. This document aims to facilitate effective interaction among various stakeholders throughout the project's lifecycle and to enhance project success through efficient communication with both internal and external parties. The SEP provides a structured framework for developing and delivering essential project communications by establishing the following:

- Type, purpose and frequency of communication,
- communication method
- and targeted audience.

The project Advisory Board members were asked to propose a normative expert and be part of a WP7 Network. This was created to help join forces with WP7 members through a number of annual meetings with the aim to improve standardisation and regulatory framework for hydrogen in railways. WP7 network activities are included in Chapter 3.

Key conclusions regarding the compatibility of the fuel-cell based propulsion system among European countries were shared with the appropriate stakeholders in accordance with the SEP. This has helped:

- to maake interfaces between stakeholders visible,.
- to identify and agree how to handle different agreements
- and to ease the harmonisation of future authorisation processes.

Partners from the WP7 have established and promoted contacts in relevant forums in their specific sectors to present the developed work resulting from Tasks 7.1 and 7.2 in order to seek the views of stakeholders and to try to stimulate follow-up activities. Relevant stakeholders are those who could provide their support to develop the basis of a regulatory framework for the use of hydrogen technology in different types of railway applications throughout Europe, and generate the necessary momentum in the railway community for this framework to lead to regulations and standardisation

Stakeholders who are engaged are those who could provide their support to the establishment of a regulatory framework that would govern the implementation of hydrogen technology across various railway applications in Europe. Their support is crucial to create the necessary momentum within the railway sector, ensuring that this framework becomes the catalyst for the development of comprehensive regulations and standardization.

2. Definition of Networking activities

To ensure that key project messages and updates are distributed to a broad range of relevant stakeholders it is necessary to determine the best methods to be used in communicating with all of them. The following networking activities have been used for the Stakeholder Engagament Plan:

Clean Hydrogen Partnership
Co-funded by the European Union

- in-person meetings,
- on-line meetings,
- special events,
- webinars,
- and emails.

Moreover, the project partners participation/collaboration with other European projects in similar areas have allowed a number of networking activities. In this sense FCH2RAIL has collaborated with:

- ERJU FP4 -RAIL4EARTH project, funded under the HORIZON-ER-JU-2022-FA4-01 call topic, which aim is to improve the existing sustainability performance of railways, to build a more attractive and resilient transport mode and to contribute towards the objectives of a climate neutral Europe for 2050. The activities are covering the Europe's Rail Flagship Project 4 Sustainable and Green Rail Systems, including rolling stock, infrastructure, stations, and all their related sub-systems (traction, bogies, brakes, energy storage systems, HVAC, etc.).
- H2TR Project and H2 Risk Analysis, which objective is to identify the solutions available on the market for the use of hydrogen in railway operations, to identify the relevant parameters and situations to be considered for a risk assessment and the corresponding methodology and the mitigation measures resulting from the risk assessment and their impact on the business (costs and asset availability).
- HYPOP project, funded by the Clean Hydrogen Partnership (HORIZON-JTI-CLEANH2-2022-2-05-01), which aims to raise public awareness and trust towards hydrogen technologies and their systemic benefits. Through the understanding of public perception and reactions to hydrogen and fuel cell technologies, HYPOP will provide citizens, consumers and end-users with guidelines and knowledge to increase their trust in hydrogen and its implementation in daily life.
- HSBooster project, funded by the EU's Horizon Europe research and innovation programme under Grant Agreement no. 101058391, which provides expert services to European projects to help them to increase and valorise project results by contributing to the creation or revision of standards.

In most of the networking activities WP7 partners have shared their current knowledge at each step of the project development. Mainly, the following public documents have been shared and disseminated:

D7.1 Gaps in regulatory framework

D7.4 Complementary Gaps in analysis framework

D7.2 Proposal for modifications of normative framework

Clean Hydrogen Partnership
Co-funded by the European Union

The details of each networking activity haven been registered in the template shown in Table 2, and are presented in Chapter 3.

Table 1. Networking activities table

Activity title	
Date	
Delivered by	
Type of activity	
Stakeholder	
Details	

Clean Hydrogen Partnership
Co-funded by the European Union

3. Networking Activities

The different networking activities carried out by the WP7 partners , are shown in chronological order.

3.1 Webinar "FCH2RAIL - Study on H2 standardisation"

Date	21/07/2022
Delivered by	CNH2
Activity	Webinar
Stakeholder	Members of WP7 network : ERA, DB, Slovakrail, JRC, SNCF and partners: CAF, RENFE, DLR, ADIF, STT, CNH2
Details	Webinar to show the results of the activities carried out in T7.1, regarding the gaps in the regulatory framework.

3.2 ERA expert meeting

Date	18/04/2023
Delivered by	CNH2, DLR
Activity	Online meeting
Stakeholder	Professional Staff, ERA
Details	Meeting to exchange viewpoints and to share more information related to the strategy to follow to propose modifications in those Regulations, Codes and Standards concerning the ERA (TSI), where gaps have been found.

3.3. Meeting with AESF (Spanish Railway Safety Association)

Date	Several meetings started on the 14/05/2024
Delivered by	ADIF
Activity	Meeting, emails
Stakeholder	Professional staff Host: ADIF Members: ADIF and AESF

Details	Meetings with AESF members to update them on the status of the project and share the status of the analysis of regulatory gaps and how they will be addressed and managed including the risks. The collaboration with the Spanish Railway Safety Association was extended over time to include meetings, reviewing, comments on the public deliverables and also a visit to the demonstrator train. Other topics like the re-homologation process have also been discussed.

3.4 DKE "Normungsroadmap Wasserstofftechnologien" (Standardization roadmap for hydrogen technologies supporting the market ramp-up)

Date	27/04/2023- July 2024
Delivered by	DLR
Activity	Meeting
Stakeholder	The project involves German Standardization Groups like DKE, DIN
Details	The "Standardization roadmap for hydrogen technologies supporting the market ramp-up" project is working together with experts from industry and business to sort out and complete the standardisation of hydrogen technologies in order to accelerate the market ramp-up of hydrogen as a whole. As one input the FCH2Rail Deliverables were considered. https://www.dke.de/de/arbeitsfelder/energy/normungsroadmap-wasserstofftechnologien https://www.din.de/en/innovation-and-research/standardization-roadmap-for-hydrogen-technologies

DLR personnel was part of a working group for railway vehicles. FCH2RAIL was included in the list of relevant projects of this working group (the findings of the project are not yet published).

Clean Hydrogen Partnership
Co-funded by the European Union

3.5. HSBooster application

Date	09/05/2023
Delivered by	DLR
Activity	Meeting, emails
Stakeholder	Professional staff
Details	HSBooster can help to improve knowledge and expertise in standardisation as well as being very helpful to know where and how to propose modifications to the existing regulations, which is one of the objectives of the FCH2RAIL project. Besides, it can help to select relevant standardisation organisations to engage with, among other networking activities. www.hsbooster.eu

3.6. HSBooster expert meeting

Date	25/07/2023
Delivered by	CNH2
Activity	Online meeting
Stakeholder	Professional staff
Details	Ralph Muller contacted CNH2 as the Expert assigned from HSbooster.eu to assist us in the standardisation activities of our project FCH2RAIL. A call was scheduled to start this service. During the meeting the D7.1 was shared and after reviewing it, Ralph Muller sent us a proposal for normative modifications. https://hsbooster.eu/pool-of-experts/ralph-mueller

3.7. RSSB Engagement

Date	During WP7 activity
Delivered by	CAF
Activity	Meeting, emails
Stakeholder	Professional staff
Details	The UK Railways Safety & Standards Board (RSSB) has been engaged in the WP7 network in the following ways: -Use of RSSB Research Project T1172 to validate the CAF LGA -RSSB's Review of CAF's LGA at Task 7.1 & 7.4 -Regular CAF/RSSB H2 meetings

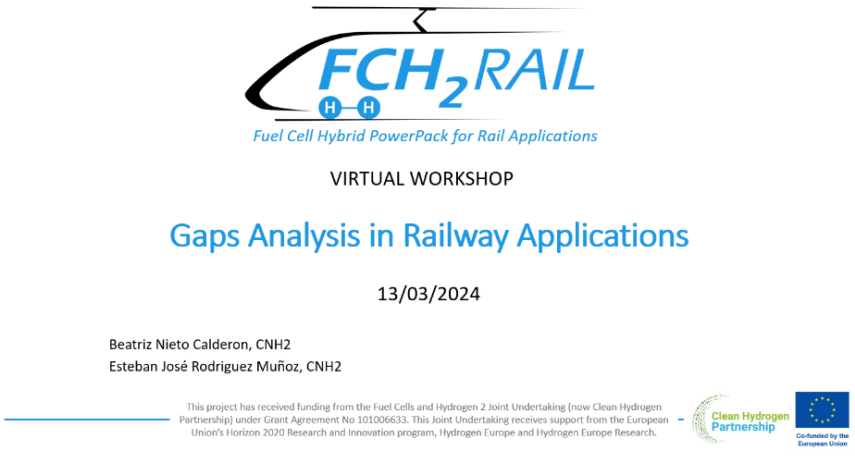
Clean Hydrogen Partnership
Co-funded by the European Union

3.8. Contact with regional governments: Aragón, Madrid, Galicia

Date	From October 2023 until April 2024
Delivered by	CNH2
Activity	Online meetings
Stakeholder	Professional staff
Details	Different meetings with industry department responsibles of the regions, in which the HRS is located in the project framework. As a result of the different consultations, a meeting between them has been carried out to discuss the issue in the Hydrogen Working Subgroup of the "*Unidad de Mercado de la Conferencia Sectorial de Industria y Pyme*". The aim of this meeting was to standardise criteria in terms of administrative procedures at national level. It is supposed to be a big step for the standardisation and introduction of hydrogen technology in new sectors such as railways. Also CNH2 has contacted the different regional administrations (depending on the region): • Aragón: the Economy, Employment and Industry department of the Government of Aragón. • Madrid: Environment, Agriculture and Interior department of the Community of Madrid. • Galicia: Economy, Industry and Innovation department of the regional Government of Galicia

3.9. Webinar "FCH2RAIL – Gaps analysis in Railway Applications"

Date	13/03/2024
Delivered by	CNH2
Activity	Webinar
Stakeholder	Members of WP7 network : DB, DSZF, partners: CAF, RENFE, DLR, ADIF, STT, CNH2 and Rail4EARTH attendees
Details	Webinar to show the results of the activity carried out on T7.1, regarding the D7.4. Complementary gaps in analysis framework



3.10. Presentation of FCH2RAIL in the KoM of the HYDROGEN RISKS project

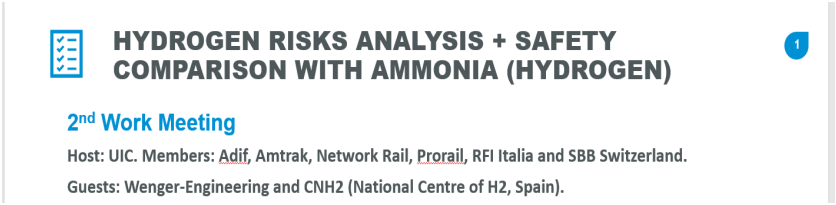
Date	19/03/2024
Delivered by	ADIF
Activity	Meeting
Stakeholder	Proffesional staff. Meeting with the following ateendees: Host: International Railway Union UIC. Members: ADIF, Amtrak, Network Rail, Prorail, RFI Italia and SBB Switzerland
Details	KoM of the HYDROGEN RISKS ANALYSIS + SAFETY COMPARISON WITH AMMONIA (HYDROGEN).

3.11. Collaboration Rail4EARTH/FCH2RAIL

Date	03/04/2024
Delivered by	CNH2
Activity	Meeting, emails
Stakeholder	Professional staff
Details	RAIL4EARTH WP1 Standardisation has one topic about the pre-standardisation of the refuelling interfaces. The aim of the collaboration between both projects is to share findings on shared topics.

3.12. Collaboration UIC/FCH2RAIL

Date	17/04/2024
Delivered by	CNH2, ADIF
Activity	Meeting
Stakeholder	Professional staff
Details	Kick off meeting of the “HYDROGEN RISKS ANALYSIS + SAFETY COMPARISON WITH AMMONIA (HYDROGEN)”



Clean Hydrogen Partnership
Co-funded by the European Union

3.13. Work on VDE/EN/IEC 63341 in Group DKE/UK 351.1

Date	Continuos participation
Delivered by	DLR
Activity	Meetings, emails
Stakeholder	German part of international standardisation body for Railway Vehicles
Details	DLR staff is part of several working groups in the DKE 351.1, that works, among others, on the IEC 63341 Railway applications – Rolling stock – Fuel cell systems for propulsion. They include findings from research, including FCH2Rail. D7.1, D7.2 and D7.4 were sent to Tolga Wichmann, chairman of the German standardisation committee DKE/AK351.1.6A/B (working on EN63341, amongst others), to take them into consideration. https://www.dke.de/de/ueber-uns/dke-organisation-auftrag/dke-fachbereiche/dke-gremium?id=2000102&type=dke%7Cgremium

3.14. Collaboration UIC – Hydrogen Risks Analysis project

Date	12/06/2024
Delivered by	ADIF
Activity	Meetings
Stakeholder	Professional Staff (30)
Details	ADIF as a member of the UIC project Hydrogen Risks Analysis presented in this meeting the authorisation process (tests) of a hydrogen train from the Infrastructure manager's point of view.

Clean Hydrogen Partnership
Co-funded by the European Union

3.15. Hydrogen Refuelling Workshop ERJU – FP4

Date	25/06/2024
Delivered by	ADIF
Activity	Meeting
Stakeholder	Professional Staff (30 participants)
Details	ADIF as a member of the ERJU – FP4 Rail4Earth project presented in this meeting the authorisation process of a hydrogen refuelling station from the infrastructure manager's point of view. This workshop included participants of the FCH2Rail project (CNH2, DLR and CAF).

3.16. International Railway Safety Council 2024 Vienna

Date	19/09/2024
Delivered by	ADIF
Activity	Conference
Stakeholder	Proffesional staff Host: ÖBB
Details	ADIF as the Spanish Railway Infrastructure Manager participated in the International Railway Safety Council in Vienna in session 2.4 "Authorization Experience in Hydrogen Trains in the Spanish Railway Network". This presentation explained the process of authorisation of the demonstrator train for testing on the Spanish rail network, as well as the challenges it presented and the conclusions that could be drawn about the regulations when authorising Spain's first hydrogen test train.

www.irsc2024.com

Clean Hydrogen Partnership
Co-funded by the European Union

3.17. ADIF – RENMAD H2 Logistics EU Zaragoza 2024

Date	17/10/2024
Delivered by	ADIF
Activity	Conference
Stakeholder	Proffesional staff (120) Host: ATA
Details	ADIF as the Spanish Railway Infrastructure Manager participated in the RENMAD H2 Logistics Congress in Zaragoza. In this conference ADIF showed its experience in the hydrogen sector and the authorisation progress as well as the challenges it faced during the process.

https://renmad.com/h2logisticseurope/agenda/

3.18. Meeting with AESF (Spanish Railway Safety Association)

Date	10/09/2024
Delivered by	CAF
Activity	Meetings
Stakeholder	Professional staff (CAF and AESF)
Details	Meeting with AESF to share the conclusions of WP7 related to the Rolling Stock, focusing on the vehicle GAP analysis conclusions.

3.19. HYPOP - Hydrogen for mobility and residential applications: safety and permitting approaches around Europe Workshop

Date	18/11/2024
Delivered by	CNH2
Activity	Workshop
Stakeholder	Professional staff (HYPOP partners and Hydrogen Week attendees)
Details	During the Hydrogen Week (www.euhydrogenweek.eu) in Brussels (18-22 November 2024) a side event was organized by HYPOP (www.hypop-project.eu). The workshop “Hydrogen for mobility and residential applications: safety and permitting approaches around Europe” explored European best practices and technical procedures with institutional stakeholders, hydrogen technology producers,

Clean Hydrogen Partnership
Co-funded by the European Union

integrators and adopters, starting a dialogue that will feed into a guidance to support smoother implementation of hydrogen installations. CNH2 presented "HRS registration barriers. Barriers enounterd registering HRS in H2Ports and FCH2RAIL projects".

3.20. Collaboration on IEC TC9 Electrical equipment and system for railways

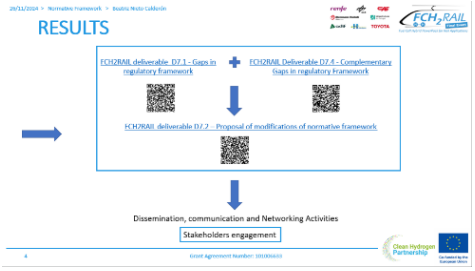
Date	Continuous participation
Delivered by	CAF
Activity	Meetings
Stakeholder	Professional staff
Details	CAF staff is part of the following IEC TC9 working groups: • IEC 63341-1, Railway applications-Rolling Stock-Fuel cell system for propulsion. Part 1: Fuel cell power system • IEC 63341-2, Railway applications-Rolling Stock-Fuel cell system for propulsion. Part 2: Hydrogen storage system • IEC 63341-3, Railway applications-Rolling Stock-Fuel cell system for propulsion. Part 3: Performance test methods

3.19. Final Event FCH2RAIL

Date	26/11/2024
Delivered by	All the partners
Activity	Event
Stakeholder	Professional staff (Partners, AB members, professional railway sector attendees)
Details	During the Final Event of the FCH2RAIL project in Zaragoza on 26th of November, the work developed in WP7 was presented to the audience and some interaction with relevant stakeholders took place. Europe's rail and ERA participants showed interest in the work carried out in WP7. ERA's representative showed a great interest in deliverable D7.2. Proposal of modifications of normative framework, with the intention to discuss with Europe's Rail to include the modification/development of the hydrogen standardisation for railway applications into a STIP (Standard Implementation Plan via the ERA research coordinator).

Clean Hydrogen Partnership
Co-funded by the European Union

The idea is to check which standardisation (or part of it) needs to be referenced in the Technical Specifications for Interoperability (TSIs) or the connected application guides.
https://www.era.europa.eu/domains/technical-specifications-interoperability_en



3.20. Meeting with ERA

Date	04/12/2024
Delivered by	CAF
Activity	Meeting
Stakeholder	Professional staff
Details	Meeting with ERA to share the conclusions of work package 7 related to the Rolling Stock, focusing on the vehicle GAP analysis conclusions

Clean Hydrogen Partnership
Co-funded by the European Union

4. Conclusions

The level of engagement has been quite satisfactory, particularly among those stakeholders interested in regulatory development and safety. Their active participation has been instrumental in advancing the project objectives.

Regarding the authorisation experience of hydrogen-powered trains, several challenges need to be addressed to ensure a successful implementation. One of the primary issues is the need for more detailed studies on the behaviour of hydrogen-powered trains in specific environments, such as tunnels, where factors like ventilation, safety in confined spaces, and emergency response protocols require careful evaluation. Additionally, significant progress must be made in developing and refining regulations to provide a clear framework for the deployment of hydrogen technology in rail transport. Without these regulations the actual implementation of hydrogen-powered trains remains uncertain.

Considering the outcome of the different engagement activities, the following conclusions regarding the normative framework have been reached:

- Normative changes should start at technical level (ISO, CEN…) and then go through TSIs level.
- Hydrogen refuelling standardisation is needed at technical and procedimental level for approval.
- It is possible to authorise a hydrogen-powered vehicle for track testing to operate on the Spanish Railway Network, despite the regulation and technical barriers. The authorisation process for a fuel cell powered vehicle has not identified any significant limitations for future implementations in trains operations.
- There is a crucial need for widespread technical dissemination and education within organisations to demonstrate that hydrogen is a safe and viable energy source. Misconceptions about the safety of hydrogen must be addressed through targeted education and communication efforts, helping stakeholders understand the technology's benefits and safety measures.
- Collaboration with ERA, AESF and technical committees is mandatory to establish the basis of hydrogen trains.

Finally, as a result of the FCH2RAIL project, standardised criteria in terms of administrative procedures at national level have been achieved in Spain.

Clean Hydrogen Partnership
Co-funded by the European Union

5. Next steps

The FCH2RAIL project has taken very important steps that allow the implementation of the technology in the railway sector. A very important activity carried out is the participation by the project partners in different technical platforms (committees, groups…) that is strongly recommended to continue. The working groups in which different partners participate are the following:

- VDE/EN/IEC 63341 in Group DKE/UK 351.1
- AESF H2 Working group.
- International Railways Safety Council 2024. Authorization Experience in H2 trains
- IEC TC9 Electrical equipment and systems for railways:
    - IEC 63341-1, Railway applications – Rolling stock – Fuel cell systems for propulsion - Part 1: Fuel cell power system
    - IEC 63341-2, Railway applications – Rolling stock – Fuel cell systems for propulsion - Part 2: Hydrogen storage system
    - IEC 63341-3, Railway applications - Rolling Stock - Part 3 Fuel Cells for Propulsion - Performance Test Methods
- ERA collaboration

It would be highly recommended that all the agents participating in the project, technologists, operators or administrators, continue to develop standardisation and normalisation protocols that have been partly initiated and continue working on the different committees for the development of standardisation and regulation.

In addition, communicating the activities that are being developed in this area to the different project participants and external agents is essential to avoid duplication of work and leaving work areas uncovered.

Targeted education and communication efforts, helping stakeholders understand the technology's benefits and safety measures are also recommended.

Clean Hydrogen Partnership
Co-funded by the European Union