



pre-Normative Research on Hydrogen Releases Assessment

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**Hydrogen Emissions and Environmental Impacts
Workshop - Sources and Sinks of Atmospheric Hydrogen**

University of California, Irvine

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Agenda

1. Introduction
2. NHyRA Partners and Stakeholders Advisory Board
3. Project context and objectives
4. Project methodology and activities
5. Project Gantt
6. WPs activities





Introduction

NHyRA project

pre-Normative Research on Hydrogen Releases Assessment

NHyRA project general info	
n° partners	15 (from 9 countries)
duration	36 months
Project budget	3,5 M€
Type of action	Research and Innovation Action
Start/end date	Jan 2024 – Dec 2026

HORIZON-JTI-CLEANH2-2023-05-03:

Pre-Normative Research on the determination of hydrogen releases from the hydrogen value chain



NHyRA Partners and Stakeholders

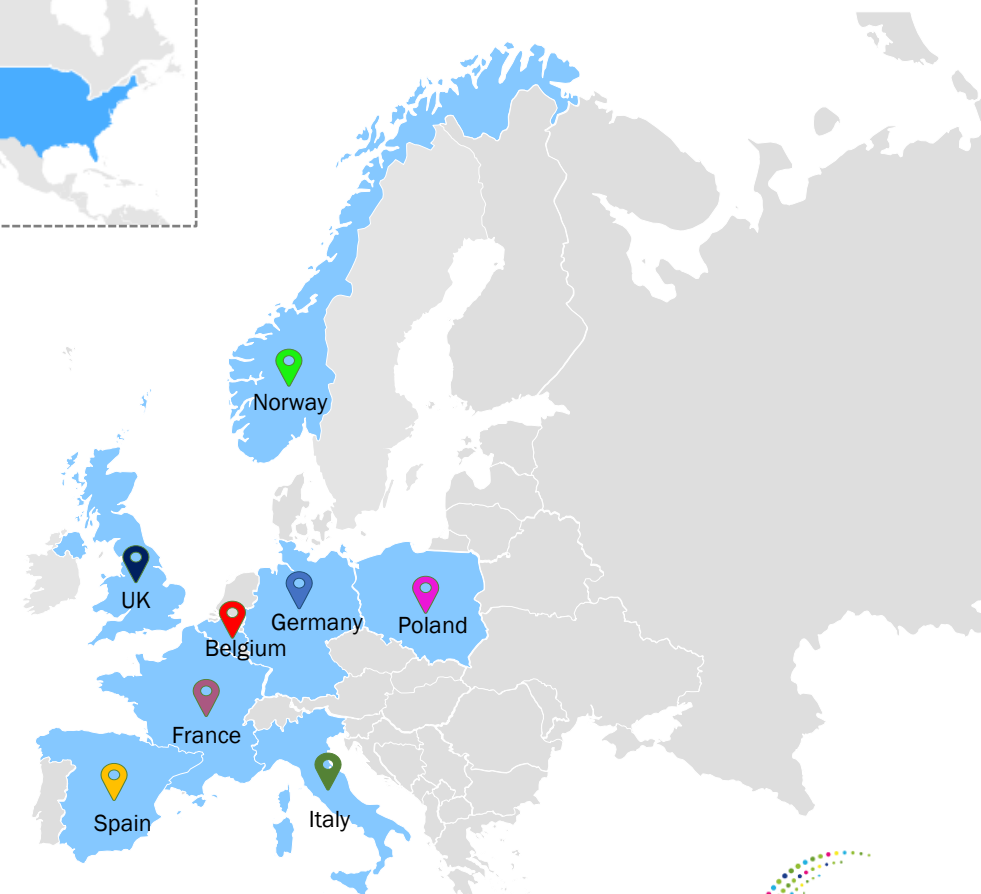
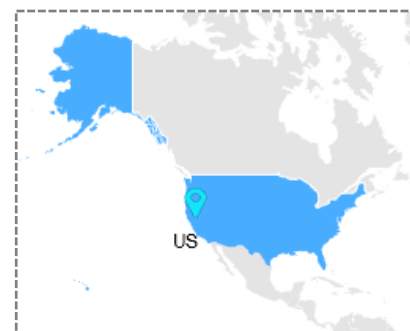
NHyRA Partners



INSTYTUT NAFTY I GAZU
– Państwowy Instytut Badawczy



UNIVERSITY OF
SURREY



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NHyRA Stakeholders Advisory Board





Context and Objectives

Project context



- H_2 as energy vector can play a central role in meeting the **Green Deal** target of climate neutrality by **2050**.
- H_2 molecule present in the atmosphere does not act as a direct greenhouse gas, it **can react with other molecules present in the atmosphere**, thus acting as an **indirect greenhouse gas**.
- To date, there is still **uncertainty regarding the amount of the H_2 emissions** expected along the future H_2 value chain, the associated environmental impact and the size of the future H_2 market.
- A **dedicated normative framework**, including testing methodologies for Hydrogen releases, **does not exist**. Instead, the CH_4 emissions regulating scheme could be a methodological reference.



Project objectives

NHyRA will focus on the **assessment of potential H₂ s along the entire H₂ value chain**. Being the knowledge about the amount of anthropogenic H₂ in the atmosphere very scarce in literature, the improvement of the capability to quantify small and large releases, **delivering validated methodologies and techniques** for measuring or calculating them, is of outstanding importance.

1. Creation of a **hydrogen release inventory** for the anthropogenic H₂ releases from the hydrogen value chains

2. Development and validation of methodologies for detecting and quantifying the H₂ releases

3. H₂ releases quantification and definition scenarios considering different time horizons (e.g. 2030, 2050)

4. Provide recommendations to International Standard Bodies. and mitigation strategies for reducing the H₂ releases identified.





Activities and Methodology

Project activities

WP1: H₂ release
inventory

WP2: Methodology
development for H₂
releases
quantification

WP3: Methodology
validation and field
tests assessment

WP4: H₂ release
from supply chains

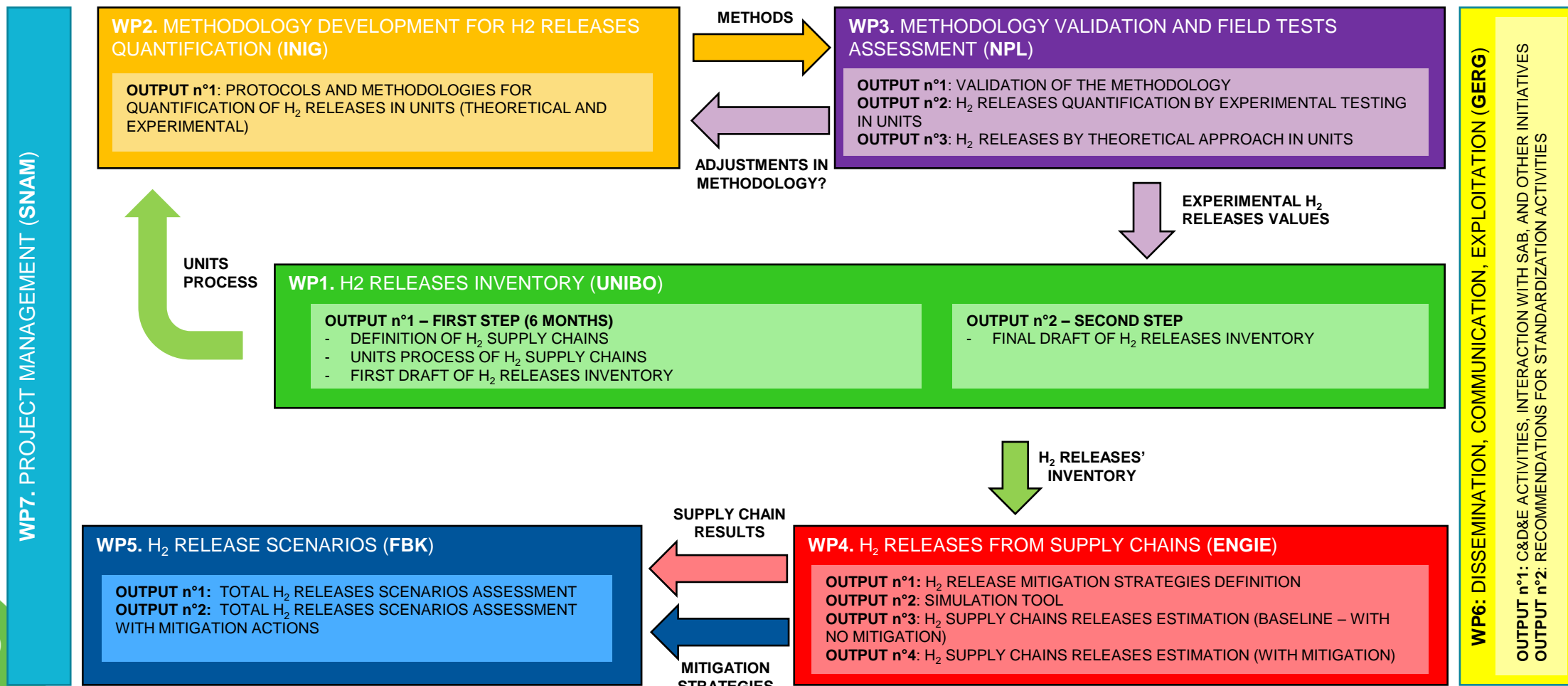
WP5: H₂ release
scenarios

WP6:
Dissemination &
Communication

WP7: Coordination
Project
management



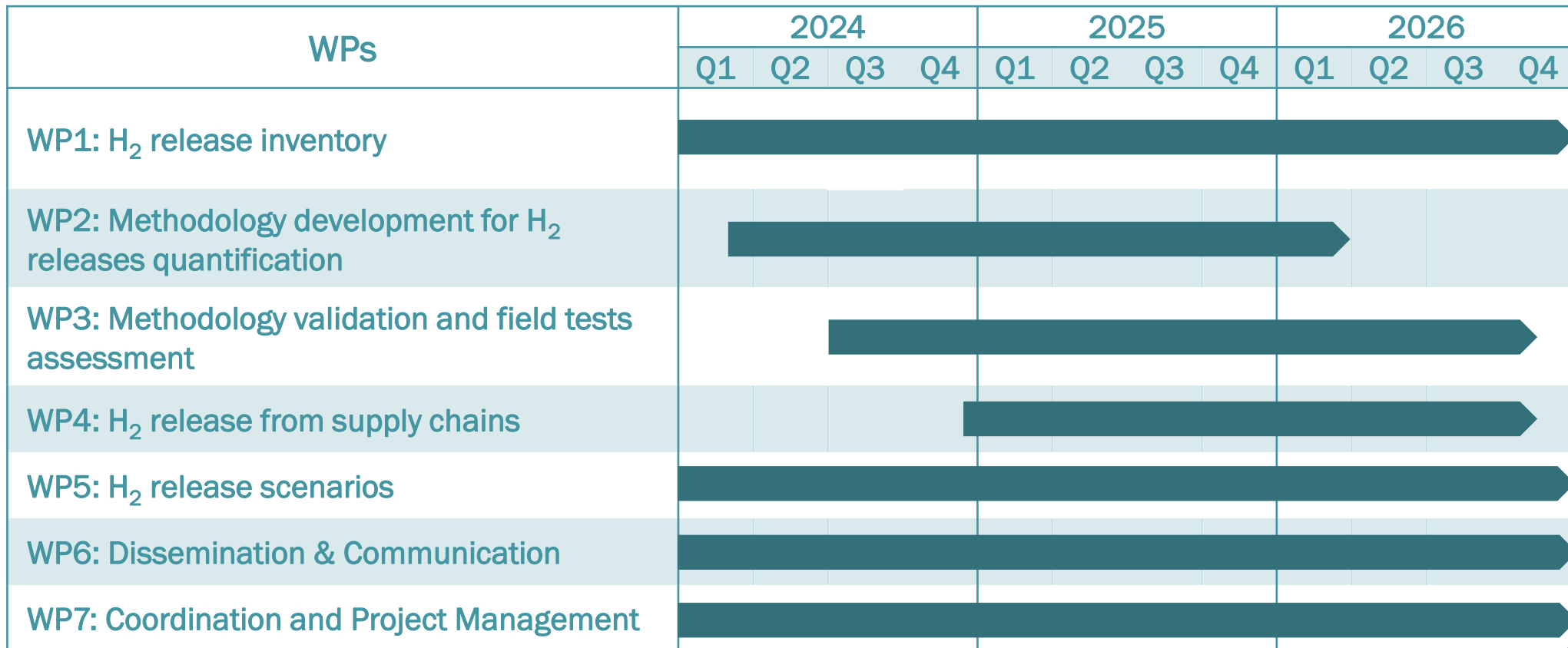
Project methodology





Gantt chart

Project Gantt





WP1: H2 release inventory

WP1 – H2 release inventory

- Objectives**
- ❑ To identify the most critical elements of the H2 value chain
 - ❑ To develop a comprehensive inventory to collect and spread data about H2 emissions
 - ❑ Link WP : WP2, WP3, and WP4

Task 1.1 (M1 – M6)



Objective: to describe the main routes in H2 supply chains as a collection of basic unit processes where to highlight H2 releases

Task 1.2 (M1 – M6)



Objective: to publish the first release version of the inventory for the H2 releases from the archetypes designed in Task 1.1

Task 1.3 (M3 – M36)



Objective: to develop and maintain updated a priority list of the most critical elements in terms of H2 releases in the value chain

Task 1.4 (M7 – M36)



Objective: to keep updated the H2 emissions inventory through experimental data and new evidences from the literature

Deliverables

- **D1.1:** H2 supply chains' unit processes (M6), Public
- **D1.2:** First version of the H2 releases' database (M6), Public
- **D1.3:** First version of the priority list of archetypes (M12), Public
- **D1.4:** Updated priority list of archetypes (M36), Public
- **D1.5:** Final version of the H2 releases' database, (M33), Sensitive





WP2: Methodology development for H2 releases quantification

WP2 – Methodology development for H2 releases quantification

- Objectives**
- ❑ Development of methods for detecting and measuring H2 fugitive emissions
 - ❑ Development of analytical methods for quantifying vent emissions based on engineering calculations
 - ❑ Development of methods for emissions quantification at the area scale

Task 2.1 (M3 – M6)
P: BH, ENGIE, SNAM,
ENAGAS, INIG



Objective: review of methods and recommendations proposals

Task 2.2 (M6 – M27)
P: BH, NPL, ENAGAS,
ENGIE, SURREY



Objective: development of leak detection and emission measurement methods

Task 2.3 (M6 – M27)
P: SURREY, BH, NPL



Objective: development of a correlation method for estimating the amount of H2 emissions from fugitives

Task 2.4 (M6 – M18)
P: BH, NPL



Objective: development of calculation-based methods to quantify emissions from sources not covered by the experiments


Deliverables and milestones

- **D2.1:** Report containing a list of techniques for detecting and measuring H2 emissions (M6), Public
- **D2.2&D2.3:** Set of standards and improved procedures for detecting and quantifying H2 emissions (M18 & M27), first version and final version, Public
- **MS3:** Set of standards and procedures for detecting and quantifying H2 emissions (M18)
- **D2.4:** Procedure for correlation method for estimating H2 releases (M27), Sensitive
- **D2.5:** Calculation-based methods to quantify releases not covered by the experiment (M18)



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WP3: Methodology validation and field test assessment

WP3 – Methodology validation and field test assessment

- Objectives**
- ❑ *Experimental validation of measurement-based methods for detection and/or quantification of H₂ emissions*
 - ❑ *Determine performance characteristics, undertake field assessments and develop measurement uncertainty budgets for the methods*
 - ❑ *Linking Work Packages : Input and outputs predominantly to/from WP2. Outputs to WP4 and WP5 via WP1.*

Task 3.1 (M7 – M14)
Lead: NPL, P : INIG, SURREY

Objective: *Develop performance test specifications including requirements on testing facilities*

Task 3.2 (M14 – M22)
Lead: NPL, P : INIG, ENAGAS

Objective: *Perform laboratory performance tests on H₂ sniffing and acoustic leak detection methods*

Task 3.3 (M18 – M30)
Lead: NPL, P : INIG

Objective: *Establish the performance of H₂ release quantification methods using traceable controlled releases*

Task 3.4 (M18 – M30)
Lead: NPL, P : SNAM, SURREY, ENAGAS, INIG, ENGIE, LINDE, EQN

Objective: *Undertake field assessments of the methods at least five real-world sites*

Task 3.5 (M30 – M34)
Lead: NPL, P : SURREY

Objective: *Assess data and develop uncertainty budgets for measurement methods*

Task 3.6 (M19 – M27)
Lead: SURREY, P : INIG

Objective: *Validate the analytical approaches used by calculation-based methods for those elements of the inventory that cannot be measured.*

Deliverables

- **D3.1:** Performance test specifications (M14), NPL, Public
- **D3.2:** Laboratory test report (M22), NPL, Sensitive
- **D3.3:** Controlled release test report (M30), NPL, Sensitive
- **D3.4:** Uncertainty calculation examples (M34), NPL, Public
- **D3.5:** Validation of analytical approaches (M27) SURREY, Sensitive





WP4: H2 releases from supply chains

WP4 – H2 releases from supply chains

- Objectives**
- ❑ Development of a methodology for upscaling emission data
 - ❑ Development of a simulation tool
 - ❑ Identification of potential mitigation strategies

Task 4.1 (M12 – M26)



Objective: get an overview of H2 releases along the value chain defined in WP1.

Task 4.2 (M18 – M30)



Objectives: identify mitigation measures, engineering solutions, technologies, research and development actions to minimize the release of H2; develop a methodology for validating and evaluating the benefits.

Task 4.3 (M30 – M34)




Objective: perform updates of the simulation tool, by adding mitigation measures.

Deliverables

- **D4.1:** Method for upscaling H2 emissions from measurements and analysis and application (M20), ENGIE, SURREY, Public
- **D4.2:** Simulation tool for H2 value chain (M26), ENGIE, SURREY, Public
- **D4.3:** Ranking of the main elements of the H2 value chain in terms of the estimated H2 release (M26), ENGIE, Public
- **D4.4:** Ranking of H2 release mitigation actions (M24), FBK, Public
- **D4.5:** Method for evaluating the impacts of mitigation strategies on H2 releases (M30), FBK, Public
- **D4.6:** Updated simulation tool for H2 value chain (M34), ENGIE, Sensitive
- **D4.7:** Benefits of mitigation measures assessed at value chain level (M34), ENGIE, Sensitive

Milestones

- **MS5:** Simulation results (M26), ENGIE
- **MS6:** Mitigation action benefits (M28), ENGIE



WP5: H₂ release scenarios

WP5 – Hydrogen Release Scenarios

- Objectives**
- ❑ Quantify H₂ releases in future hydrogen economy scenarios
 - ❑ Assess effectiveness of mitigation strategies developed by WP4
 - ❑ Bridge activities between NhyRA and Hydra Projects

Task 5.1 (M12 – M24)
P : ENEA, SURREY, INIG,
UNIBO, DLR; GERG



Objective : Select relevant H₂ economy development scenarios from energy outlook reports

Task 6.2 (M12 – M36)
P : ENEA, SURREY, ENGIE



Objective : Provide H₂ release mitigation strategies for European H₂ economies.
Quantify H₂ releases from a European H₂ economy for climate impact assessment

Task 6.3 (M1 – M36)
P : FBK, SURREY, INIG, SNAM, UNIBO,
DLR, ENGIE



Objective : Facilitate coordination between NHyRA and Hydra Projects towards the common goal of providing an accurate estimate of the H₂ releases and their impact on the climate and identify effective mitigation strategies

Deliverables

- **D5.1:** Review of H₂ economy scenarios (M24), FBK, Public
- **D5.2:** H₂ releases of H₂ economy scenarios and effects of mitigation actions: benefits of H₂ release mitigation strategies (M36), FBK, Public
- **D5.3:** Annual reporting of liaison activities with Hydra (M36), ENEA, Public





WP6: Communication, Dissemination and Exploitation

WP6 – Communication, Dissemination and Exploitation

- Objectives**
- ❑ To communicate project activities and results to the public and specific target groups
 - ❑ To promote the exploitation of the results, by relevant stakeholders, beyond the project
 - ❑ Link WP : ALL

Task 6.1 (M1 – M36)
P : ALL



Objective: Develop and implement the Communication, Dissemination and Exploitation Plan

Task 6.2 (M1 – M36)
P : ALL



Objective: raise awareness of the value of NHyrA liaise with stakeholder community and actively disseminate research outcomes and best practices

Task 6.3 (M1 – M36)
P : ALL



Objective: Clustering activities, interaction with the advisory board, CH JU, standardization bodies and other initiatives

Task 6.4 (M1 – M36)
P : ALL



Objective: Develop and implement the exploitation and business strategy

Deliverables

- **D6.1:** Communication, Dissemination and Exploitation Plan (M6), Public
- **D6.2:** Communication, Dissemination and Exploitation Plan (M18), Public
- **D6.3:** Communication, Dissemination and Exploitation Plan (M36), Public
- **D6.4:** Project Website (M3), Public
- **D6.5:** General stakeholder workshop for scientific/technical community (M18), Public
- **D6.6:** Closing public workshop (M36), Public





WP7: Coordination and Project Management

WP7 – Coordination & Project management

Objectives

- ❑ Ensure the project progress in line with the budget and the schedule by assessing project risks
- ❑ Carry out the overall administrative and financial management and reporting of the project
- ❑ Manage the IPR related to the achieved results and ensure an appropriate data management plan

Task 7.1 (M1 – M36)

Lead: SNAM, P : ALL



Objective: Coordination of Knowledge and Innovation management activities

Task 7.2 (M1 – M36)

Lead: SNAM, P : ALL



Objective: Technical work coordination, project meetings and reporting

Task 7.3 (M1 – M36)

Lead: SNAM, P : ALL



Objective: Overall legal and contractual management including IPR management

Task 7.4 (M1 – M36)

Lead: SNAM, P : ALL



Objective: Financial and Administrative Management

Task 7.5 (M1 – M36)

Lead: SNAM, P : ALL



Objective: Project risk management

Task 7.6 (M1 – M36)

Lead: SNAM, P : ALL



Objective: Data management

Task 7.7 (M1 – M36)

Lead: SNAM, P : ALL



Objective: Annual reporting for the Clean Hydrogen JU

Task 7.8 (M1 – M36)

Lead: SNAM, P : ALL



Objective: Assessment of the progress towards the achievement of the project KPIs

Deliverables

- **D7.1:** Management guidelines (M3), SNAM, SEN
- **D7.2:** Preliminary Data Management Plan (M6), UNIBO, SEN
- **D7.3:** Annual data reporting for the Clean Hydrogen JU 2025 (M15), SNAM, Public
- **D7.4:** Annual data reporting for the Clean Hydrogen JU 2026 (M27), SNAM, Public
- **D7.5:** Final Data Management Plan (M36), UNIBO, SEN



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Thank you!

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