Overview of the Clean Hydrogen Partnership

Presentation for the Spanish Office for Science and Technology, SOST-CDTI office in Brussels

22 May 2023

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Project Officer

Co-funded by the European Union

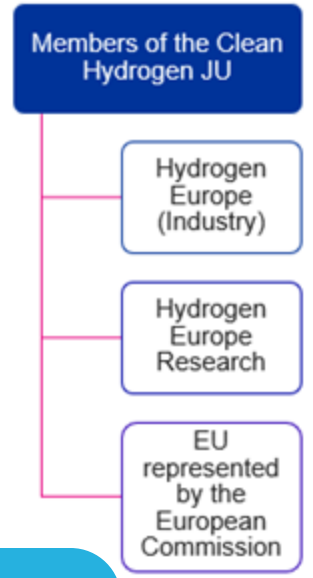
Content

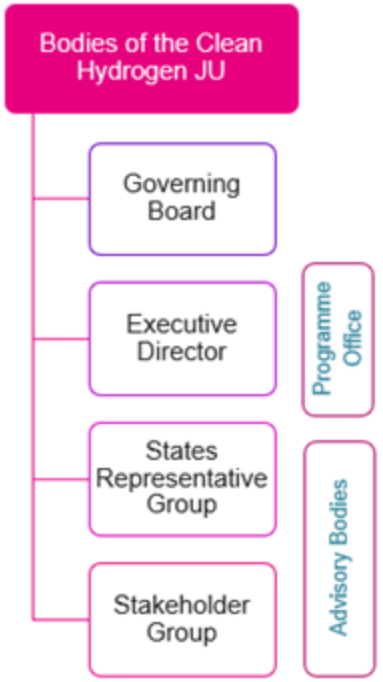
Clean Hydrogen Partnership/JU

- **Council Regulation establishing the Joint Undertakings** under Horizon Europe

  (adopted 19 November 2021 & into force 30 November 2021)

- **Budget:** 1 billion EURO from Horizon Europe (to commit until 2027 and implement until 2031)
- **Governance:** Governing Board (three members: Commission, HE, HER) + advisory bodies (SRG, SG)
- *Need also to collect independent opinions of the wider scientific community, through a scientific advisory workshop (during H2Week/H2Forum)*





Research & Innovation Activities (SRIA multi-annual doc)

- Renewable hydrogen production
- Hydrogen transmission, distribution and storage
- End-use technologies in transport, buildings and industry (incl. fuel cells, burners, boilers, etc.)

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Clean Hydrogen Joint Undertaking

EU Institutional Public-Private Partnership (IPPP)

To facilitate the transition to a greener EU society through the development of hydrogen technologies

Clean Hydrogen Partnership

Objectives

General

- Support the implementation of the Commission's Hydrogen Strategy
- Stimulate research and innovation on clean hydrogen production, distribution, storage and end use applications
- Strengthen the competitiveness of the EU clean hydrogen value chain
- Contribute to the EU ambitious 2030 and 2050 climate ambition

Specific

- Improve the cost-effectiveness, efficiency, reliability, quantity and quality of clean hydrogen solutions across entire value chain
- Strengthen the knowledge/capacity of scientific and industrial actors along the Union's hydrogen value chain while supporting the uptake of skills
- Demonstrations of clean hydrogen solutions with a view to local, regional and Union-wide deployment, aiming to involve stakeholders in all Member States and across entire value chain
- Increase public and private awareness, acceptance and uptake of clean hydrogen solutions

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Clean Hydrogen JU Programme

inc legacy of FHC JU

H_2 Valleys

3 Projects

€ 35 million

H_2 End Use: Clean Heat and Power

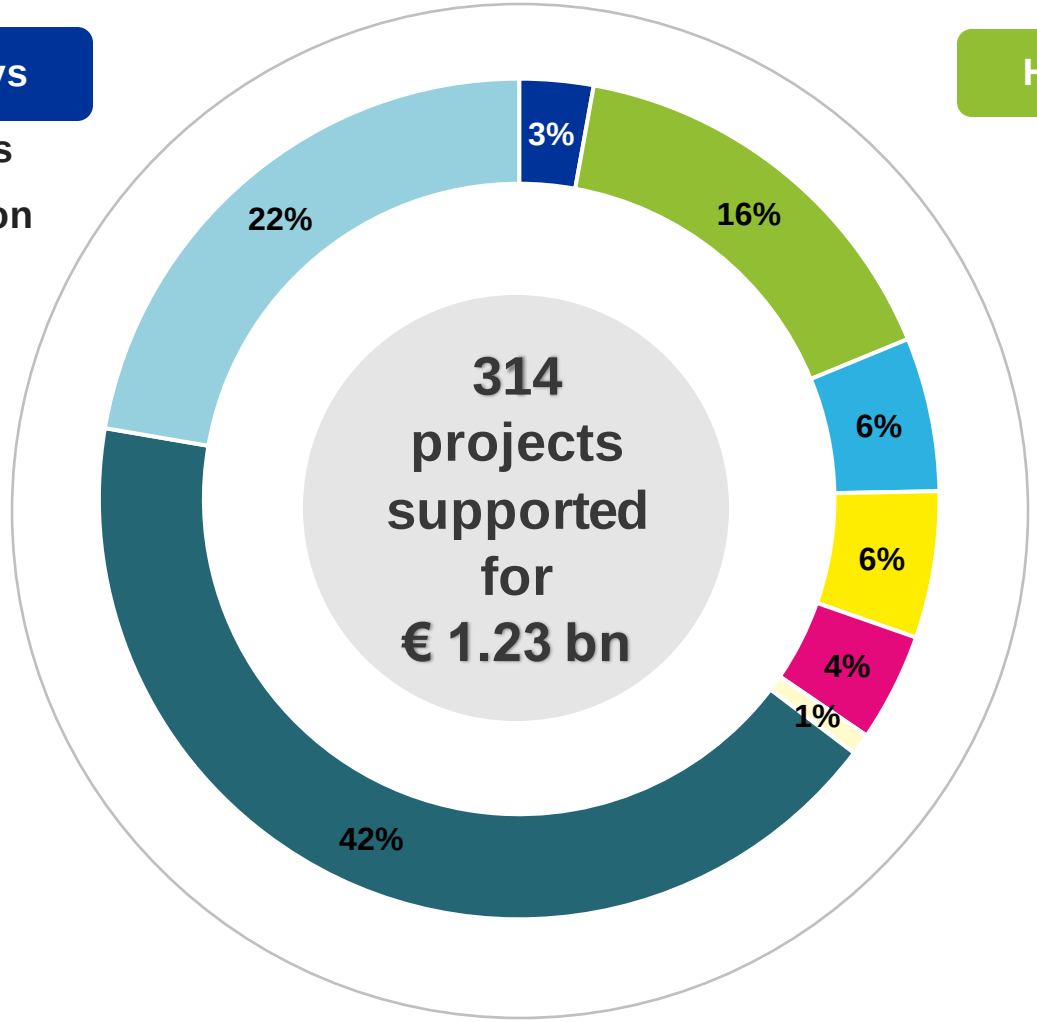
81 Projects

€ 274.7 million

H_2 End Use: Transport

74 Projects

€ 521.8 million



H_2 Production

Electrolysis & Other routes

62 Projects

€ 196.4 million

H_2 Storage & Distribution

27 Projects

€ 72.9 million

Cross-cutting

49 Projects

€ 69.5 million

Supply Chain

17 Projects

€ 51.4 million

Strategic Research Challenge

1 Project

€ 10 million

EUROPEAN PARTNERSHIP

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*It excludes the results of call 2022-2

Clean Hydrogen Partnership

15 years journey of the Joint Undertaking

From research to delivering solutions in the market










Large scale field trials

New applications

Next generation of products

Manufacturing

Large scale field trials

Next generation of cells and stack

Small scale field demonstrations

Early PoC fuel cell

Degradation and lifetime

Materials

Component improvements

Market Pull

Developing new business cases

End users strongly present in projects

Industries, regions, cities

Research and Industry working together

Early research

Co-funded by the European Union

Low temperature electrolysis Demonstration Projects

In 11 years electrolyser capacity increased 500× and funding per MW installed reduced 100×

Project: **Don Quichote**
Place: Belgium
Date: **2011**
Electrolyser: Hydrogenics
Funding: 5.0 m€

0.15 MW

Project: **Haeolus**
Place: Norway
Date: **2017**
Electrolyser: Hydrogenics
Funding: 5.0 m€

2.5 MW

Project: **H2future**
Place: Austria
Date: **2016**
Electrolyser: Siemens
Funding: 12 m€

6.0 MW

Project: **Djewels**
Place: The Netherlands
Date: **2018**
Electrolyser: McPhy
Funding: 11 m€

Djewels → Scale-up → HEAVENN

20 MW → 60MW

3x100 MW

1.2 MW

Project: **Hybalance**
Place: Denmark
Date: 2014
Electrolyser: Hydrogenics
Funding: 8.0 m€

3.2 MW

Project: **Demo4grid**
Place: Austria
Date: **2016**
Electrolyser: IHT
Funding: 2.9 m€

10 MW

Project: **Refhyne**
Place: Germany
Date: **2017**
Electrolyser: ITM
Funding: 10 m€

Green Deal Projects:
- **Refhyne II**
- **GreenHyScale**
- **GreenH2Atlantic**

Date: **2021**
Funding: ≈30 m€

European Commission

PEMEL

AEL

Other Activities

Additional activities are necessary to fulfil the Clean Hydrogen JU objectives

- Developing synergies with other partnerships and programmes
- Regulations, Codes and Standards
- European Hydrogen Safety
- European Hydrogen Sustainability and Circularity
- Knowledge management
- Competitiveness, SMEs
- International Cooperation
- Communication activities

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Strategic Research and Innovation Agenda 2021 – 2027

Overview

The overall goal of the Clean Hydrogen JU is to support research and innovation (R&I) activities in the Union in clean hydrogen solutions and technologies, under EU's new funding programme for research and innovation, Horizon Europe, established by the Horizon Europe Regulation, and in synergy with other EU initiatives and programmes

Hydrogen is also included in other parts of Horizon Europe and other EU programmes

The SRIA covers therefore the duration of Horizon Europe (2021-2027) and identifies the key priorities and the essential technologies and innovations required to achieve the objectives of the joint undertaking including technology targets :

It guides and informs the areas covered in the JU annual call for proposals

It also includes (aligned with the Council Regulation)

- programe implementation including budget, conditions for participation and eligibility for funding, types of action, specific provisions and funding rates, rules for participation
- programme monitoring and reporting (programme Level Key Performance Indicators and technology targets)

This allows to have specific topics conditions, e.g. at least one partner is a member of the JU Private Partner

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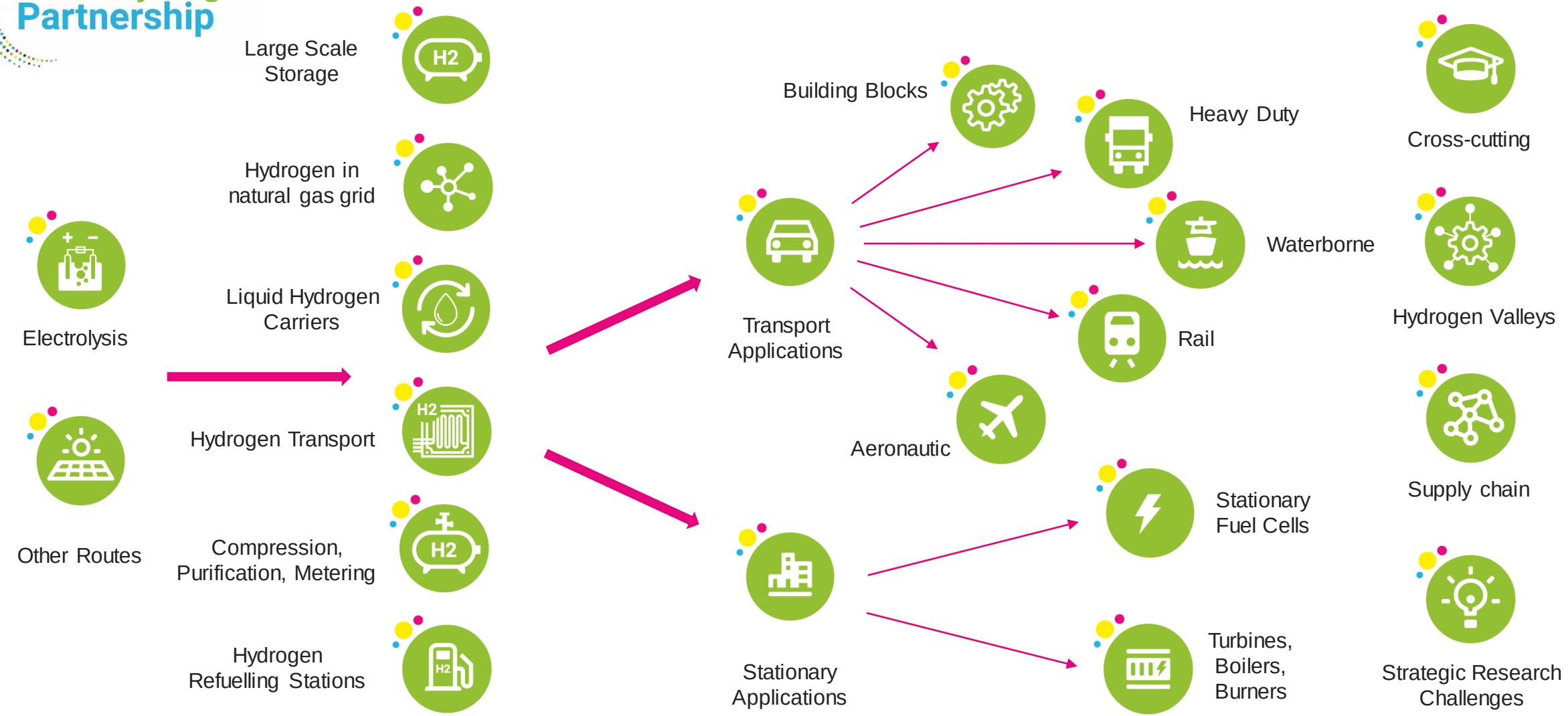
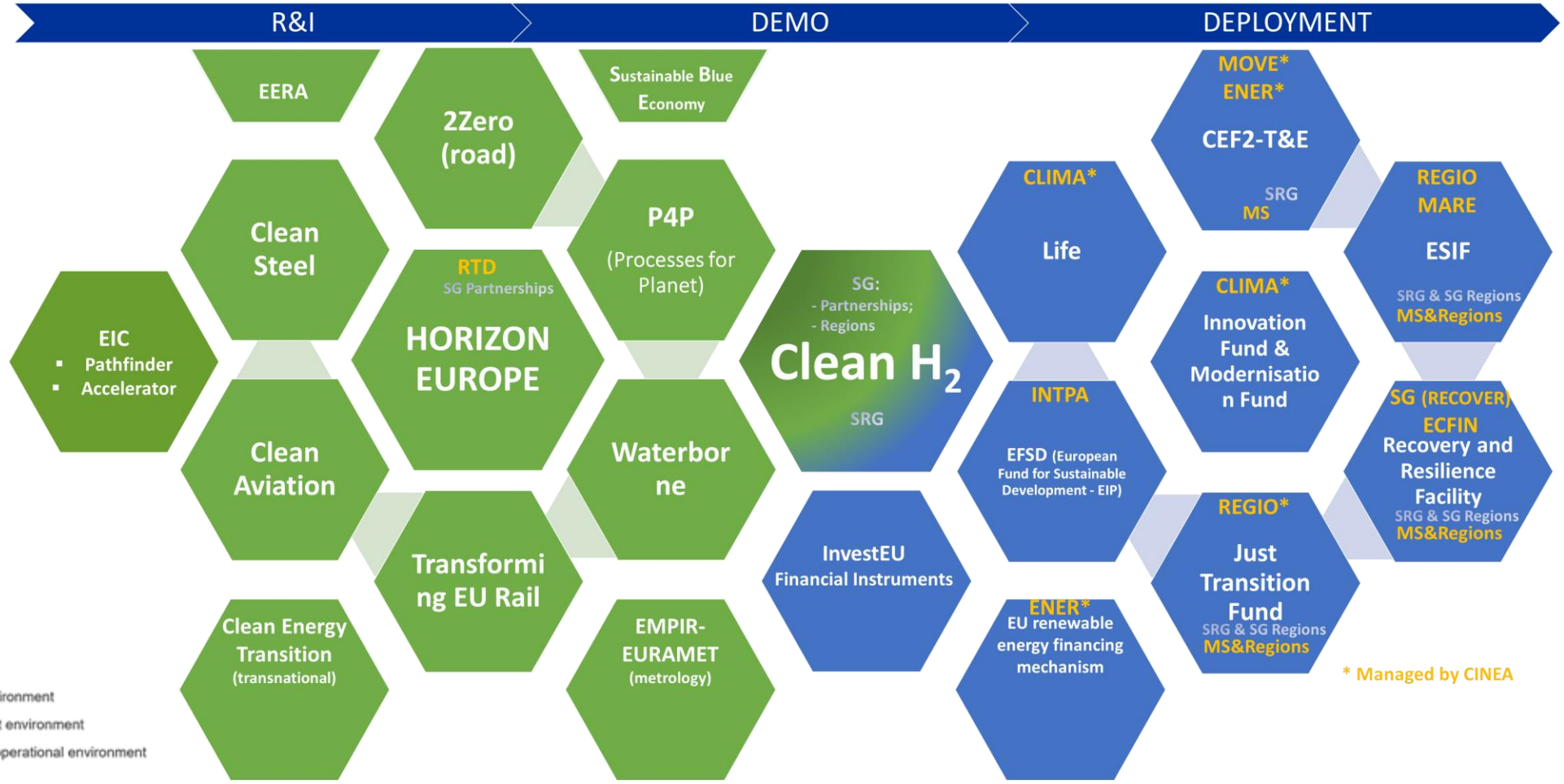
SRIA Priorities: R&D across the whole hydrogen value chain



Synergies in the Clean Hydrogen Partnership

Strong cooperation is key to deal with bigger yet fragmented EU and National/Regional Funds to meet EU ambitions



RIA

IA

TRL 1 – basic principles observed
TRL 2 – technology concept formulated
TRL 3 – experimental proof of concept
TRL 4 – technology validated in lab
TRL 5 – technology validated in relevant environment
TRL 6 – technology demonstrated in relevant environment
TRL 7 – system prototype demonstration in operational environment
TRL 8 – system complete and qualified
TRL 9 – actual system proven in operational environment

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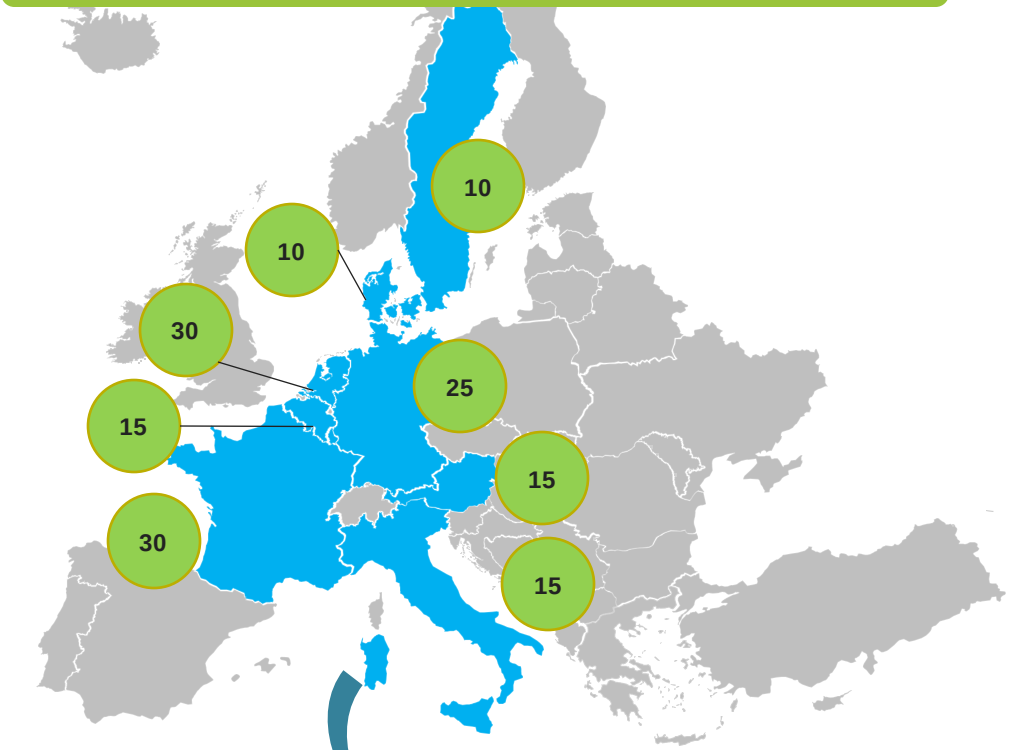
Working with other EU programmes to implement Call for Proposals in Synergies

H2Accelerate

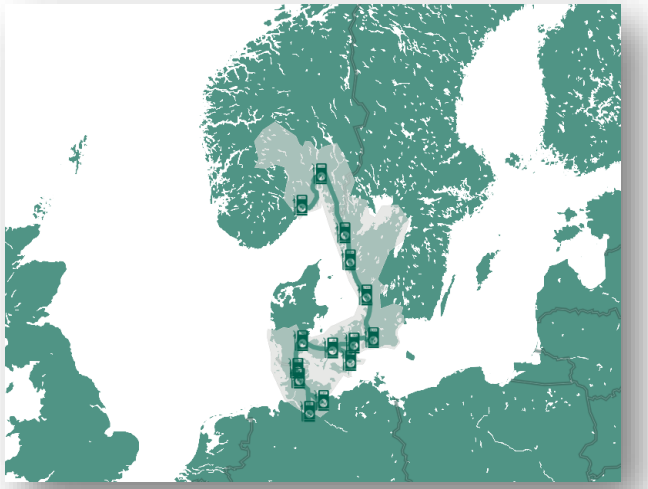
CINEA

GREATER4H

8 countries, 150 trucks



4 countries, 14 HRS



Focus on TEN-T corridors

Co-funded by the European Union

Synergies for large-scale flagship projects such as Hydrogen Valleys

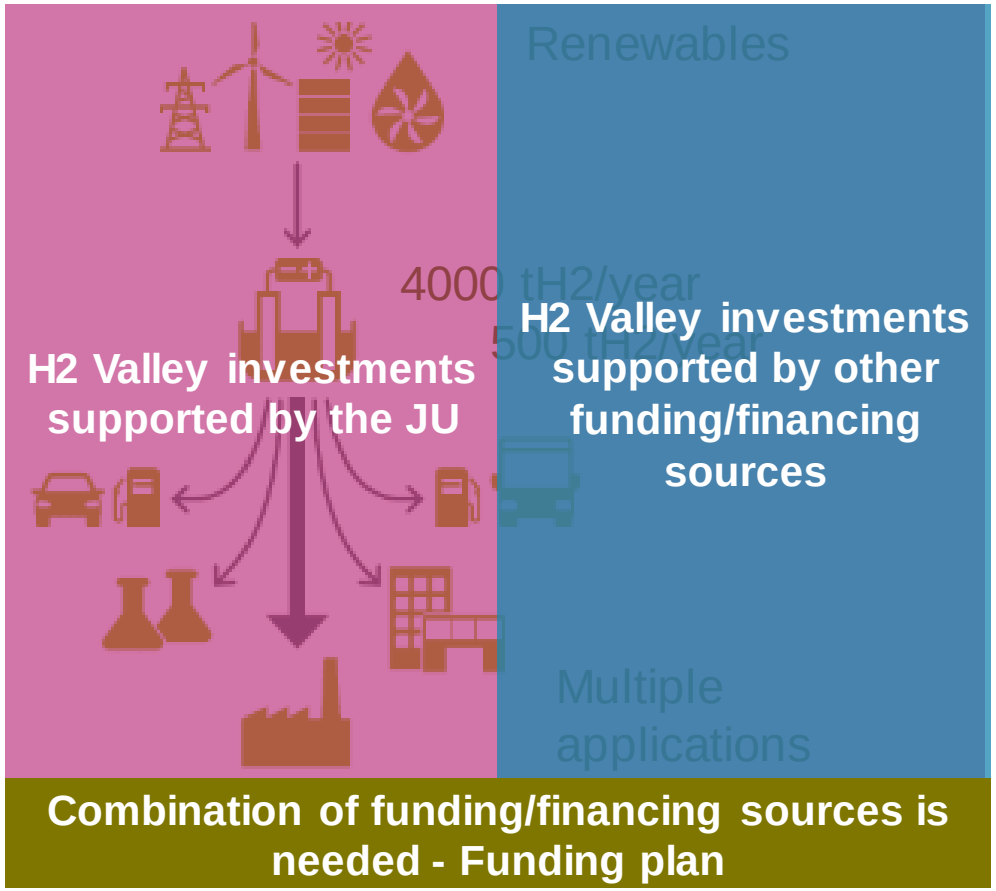
*A **Hydrogen Valley** is a defined geographical area where hydrogen serves **more than one end sector or application** in mobility, industry and energy.*

*They typically **comprise a multi-million euro investment** and cover all necessary steps in the hydrogen value chain, from production (and often even dedicated renewable electricity production) to subsequent storage and its transport & distribution to various off-takers.*

The JU funding represents a **fraction of the overall necessary investments** -> **co-funding from other sources is needed**

Proposals in the JU Calls should provide a **funding plan** to ensure implementation of the project in **synergies with other sources of funding**.

We are aware of the challenges when it becomes to the combination of different sources fo funding (e.g R&I Horin Europe with



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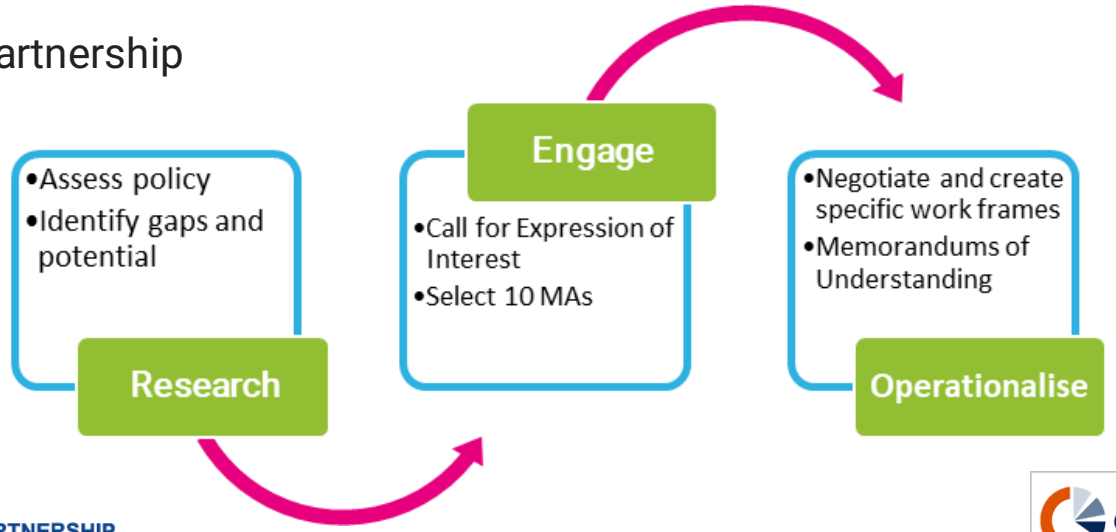
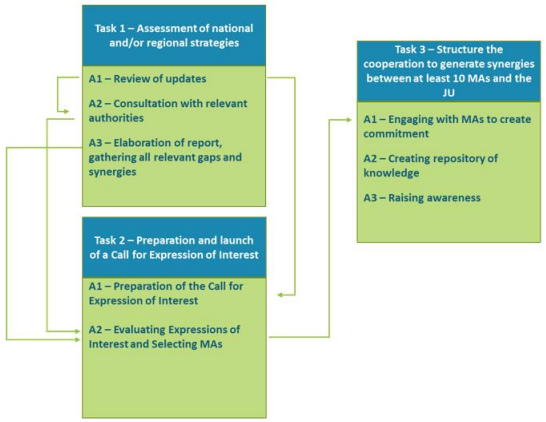
Creating Synergies with Member States and Regions

- Analyse the state of play of hydrogen development in Member States/ Regions.
  - Questionnaires have already been sent to the members of the Clean Hydrogen JU SRG (Member States Representatives Group)
- Create a cooperation mechanism between Member States'/ Regions' Managing Authorities and the Clean Hydrogen Partnership
  - Call for Expression of Interest addressed to national and regional Managing Authorities – to be launched ve
  - Select ~10 Managing Authorities to operationalise synergies with the JU in the form of MoU
- Foster synergies between EU, national and regional funds regarding clean hydrogen R&I
- Promote knowledge transfer between Member States/ Regions' Managing Authorities and the Clean Hydrogen Partnership





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Working with regions - Raising awareness, developing ideas and implementing hydrogen projects

FCH Regions initiative (2016-2018)

To support cities and regions with an interest in FCH technologies

Engagement

- Business cases for FCH applications;
- Mapping of local assets;
- Identification of existing funding;

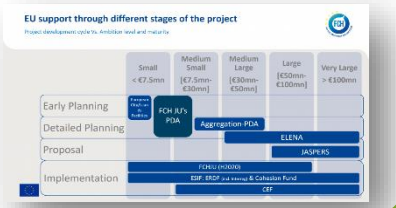
Report

- FCH applications: status and potential;
- FCH plans and ambitions;
- Way forward;

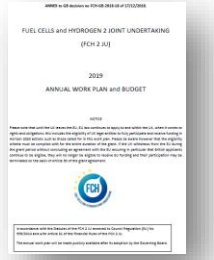
MOU

- 89 European Regions;
- 22 countries
- ¼ of Europe's population, surface & GDP;

Project Development Assistance



JU funding via its Annual Work Plans



Mission Innovation Hydrogen Valley Platform

Clean Hydrogen Partnership

MISSION INNOVATION

Co-funded by the European Union

Project Development Assistance Initiative of the Clean Hydrogen Joint Undertaking

The rationale

The driver

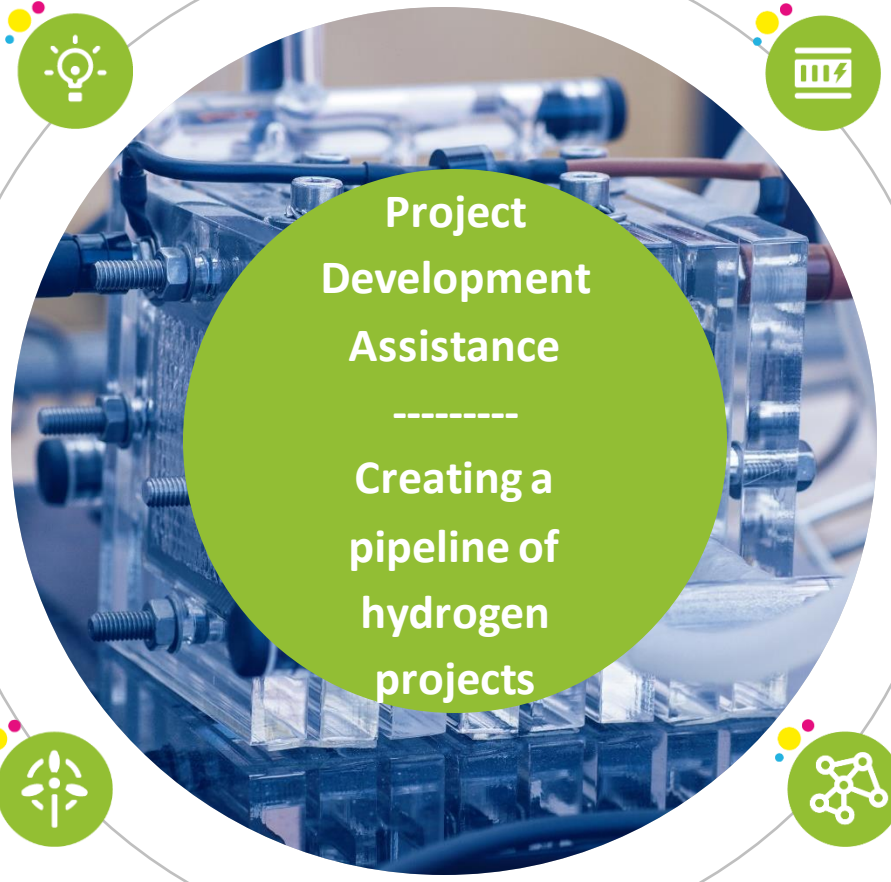
- Regions and cities are a key driver to achieve the EU decarbonization goals;
- Fuel cells and H2 can enable local authorities to achieve their energy and climate plans;

The Issue

- Public authorities lack access to financial , technical and legal expertise to deploy FCH technologies;

What is it?

- The Project Development Assistance initiative aims at solving these issues and cooperate with the local authorities;



The implementation

PDA I (2020-2021)

- 11 regions were directly supported leading to concrete hydrogen plans with equivalent CAPEX of EUR 650 – 750million
- +20 regions benefited form know-how transfer vi the Observer Network

PDA II (2023-2024)

- 15 regions selected from Cohesion Countries, Outermost Regions or Islands
- Dissemination activities planned to reach other regions

Overall Goal

- Help regions and cities to transform their ideas into more mature projects leading to the launching of investments

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Hydrogen valleys: An accelerator for a European hydrogen economy

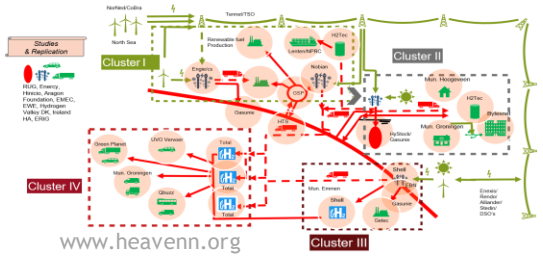
A Hydrogen Valley is a defined geographical area where hydrogen serves more than one end sector or application in mobility, industry and energy. They typically comprise a multi-million euro investment and cover all necessary steps in the hydrogen value chain, from production (and often even dedicated renewable electricity production) to subsequent storage and its transport & distribution to various off-takers.

1

BIG-HIT:

- Pioneering H2 Ecosystems, set the basis for the H2 Valleys that followed
- H2 production by wind on Islands
- Storage & transportation by truck
- End uses: heat (school), power (ferries) & mobility (municipality cars)

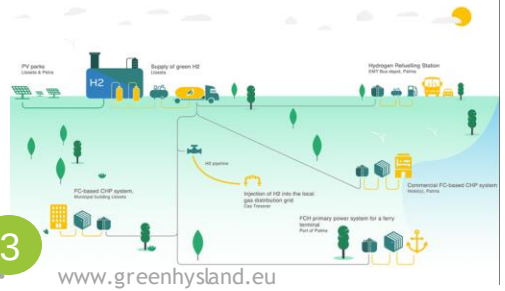
2



2019: North Netherlands

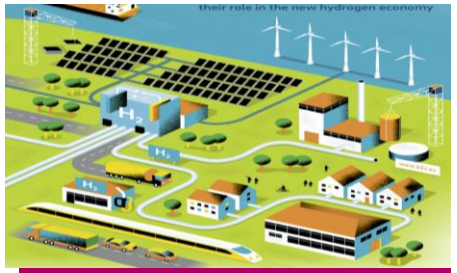
- Large number of public + private partners
- H2 production via electrolysis
- Mobility: buses, passenger cars, inland water vessel, trucks + HRSs
- E-Kerosene for aviation, gas turbine. residential heating
- H2 pipelines + H2 injection in gas grid, tube trailers
- Underground H2 storage
- 1,500 tons H2/year

3



2020: Hydrogen Island (Spain)

- Public + Private collaboration
- H2 production from solar PV
- H2 injection in gas grid + H2 pipeline + tube trailers
- Heat and power (hotel, municipal building, port of Palma)
- Mobility (public buses, light duty vehicles + HRS)
- 300 tons H2/year



REPowerEU plan for H2Valleys

- 3 years of full support, to accelerate deployment of H2V in Europe (EUR 60 mn in 2023; EUR 60 mn in 2024; EUR 80 mn in 2025)
- 9 H2 Valleys have been selected for Grant Preparation, total funding requested EUR 105.4 mn
- North Adriatic, Baltic Sea Corridor, Bulgaria, Greece, Ireland, Italy, Turkey and Luxembourg.

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Hydrogen valleys: An accelerator for a European hydrogen economy – current status of JU funding

JU Annual Work Plans	Projects	JU contribution
AWP 2015	BIG HIT	€ 5 MEUR
AWP 2019	HEAVENN	€ 20 MEUR
AWP 2020	GREEN HYSLAND	€ 10 MEUR
AWP 2022	9 valleys*	€ ~ 105 MEUR*
AWP 2023	Ongoing..	Ongoing..

REPowerEU Plan
€ 200 for H2 valleys

**Grant signature ongoing, figures may change*

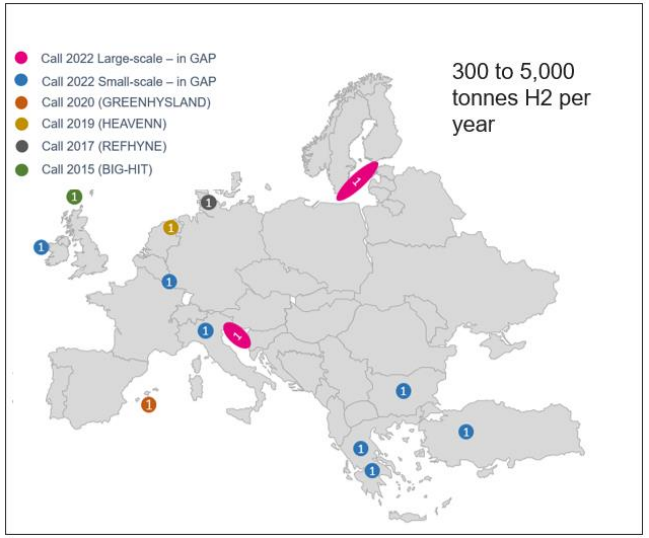
RepowerEU plan for Hydrogen Valleys

+ EUR 200 million over 3 years to double H2V in EU by 2025 (60 in 2023; 60 in 2024 and 80 in 2025)

9 H2 Valleys selected for Grant Preparation under the Call 2022

- Total funding requested EUR 105.4 mn
- North Adriatic, Baltic Sea Corridor, Bulgaria (Stara Zagora), Greece (Crete and Corinthia), Ireland (Galway), Italy (Lombardy), Turkey (South Marmara) and Luxembourg.

Hydrogen Valley supported by the JU or in grant preparation stage



REFHYNE was supported by the JU as a hydrogen production for industry project only. With time the hydrogen produced is also used for the mobility sector

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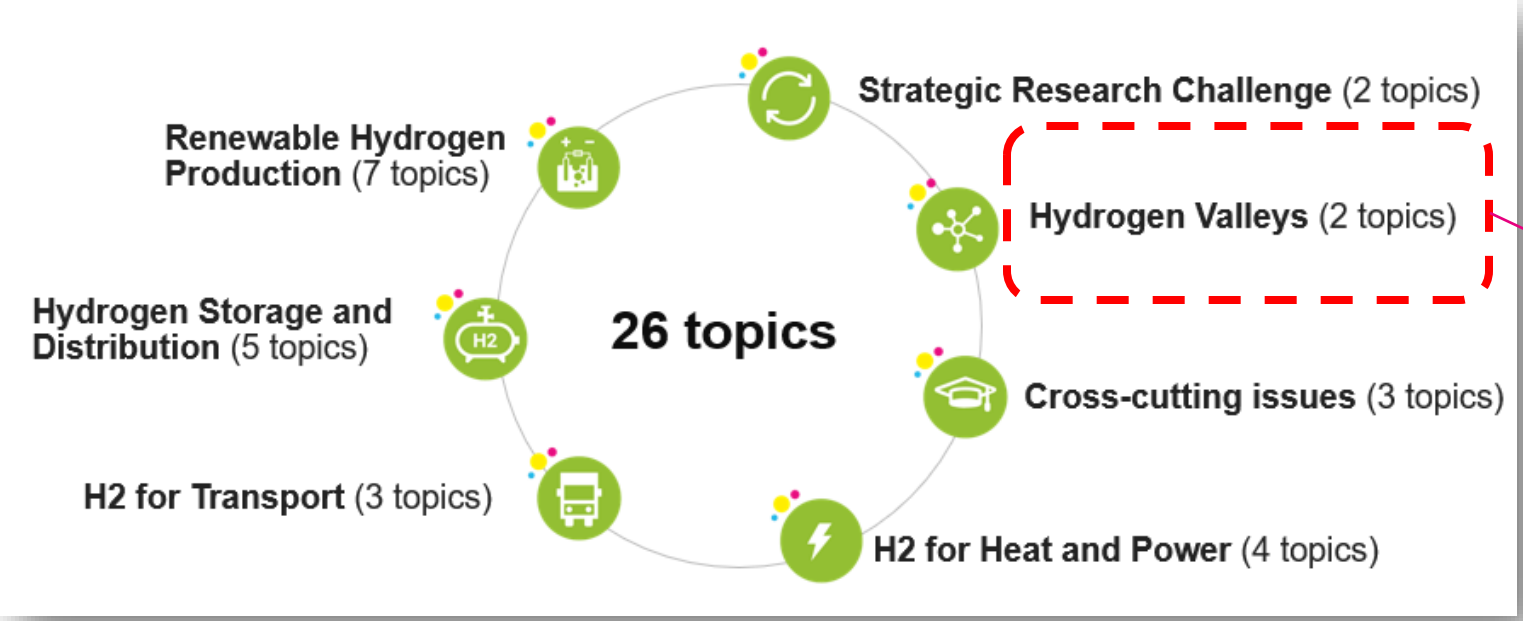
Hydrogen valleys: An accelerator for a European hydrogen economy – Call for Proposals 2023

Total budget: 195 M€
Publication date: 17th January 2023
Opening of submission: 31st January 2023
Deadline: 18th April 2023



28 proposals for valleys!

Co-funded by the European Union

Hydrogen Towards an EU Roadmap for Hydrogen Valleys: An accelerator for a European hydrogen economy

- The Clean Hydrogen Partnership, the European Hydrogen Valleys Partnership and the Northern Netherlands region organised the workshop **"Towards an EU Roadmap for Hydrogen Valleys – Regional actors and their role: double the number of valleys by 2025 and build-up skills",** on 28 February and 1 March 2023 in Brussels.

- The purpose of this two-day workshop was for the regional and local actors to talk about **current opportunities and challenges in rolling-out and scaling-up Hydrogen Valleys in Europe**.

Brussels, 28th Feb and March 1st

https://www.clean-hydrogen.europa.eu/towards-eu-roadmap-hydrogen-valleys_en

Main conclusions published the JU website

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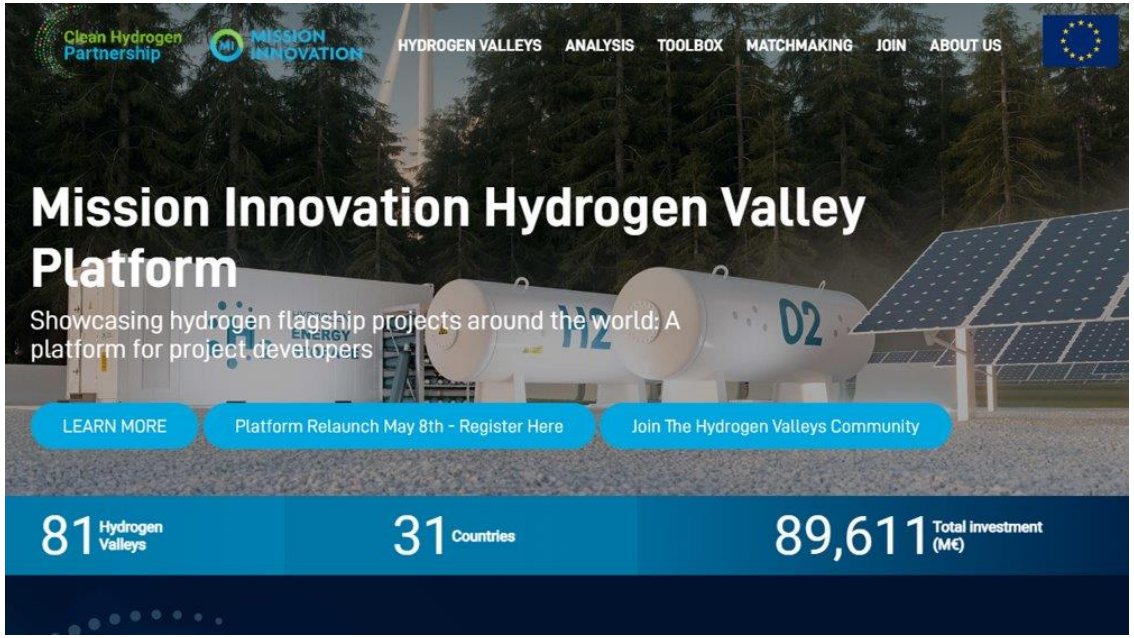
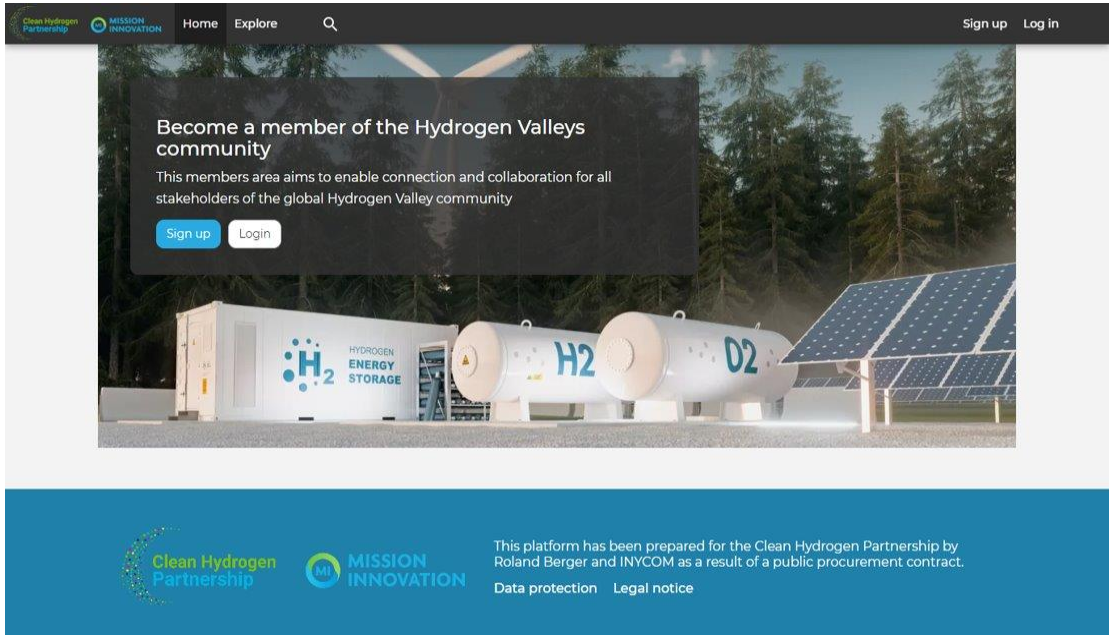
Mission Innovation Hydrogen Valley Platform

Hydrogen Valleys have become a global theme

8th of May

Official relaunch of the platform





Take a look at the website here

https://h2v.eu

Mission Innovation Hydrogen Valley Platform

Hydrogen Valleys have become a global theme

Jan 2021	37 Hydrogen Valleys	20 Countries	33,495 Total investment (M€)
May 2023	81 Hydrogen Valleys	31 Countries	89,611 Total investment (M€)

Hydrogen Valleys

- Interactive map

- Searchable database

Analysis

- Statistics

- Barriers

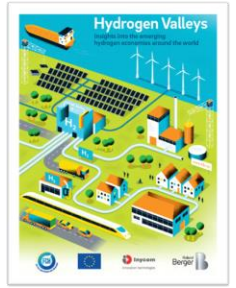
- Best practices

- Reports

Toolbox

Matchmaking

+



2 reports published already:

- Background
- Barriers
- Success factors
- Best practices
- Recommendations for policy makers

https://h2v.eu/analysis/reports

Clean Hydrogen Partnership

Co-funded by the European union

This platform has been prepared for the Clean Hydrogen Partnership by Roland Berger and INYCOM as a result of a public procurement contract.

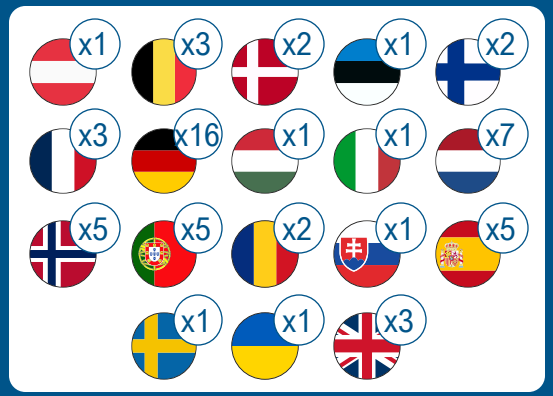
Clean Hydrogen Partnership

Co-funded by the European union

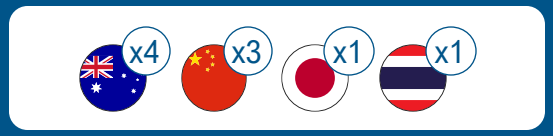
This platform has been prepared for the Clean Hydrogen Partnership by Roland Berger and INYCOM as a result of a public procurement contract.

Hydrogen Valleys are truly going global – As of today, we have identified more than 80 Hydrogen Valleys under development around the world

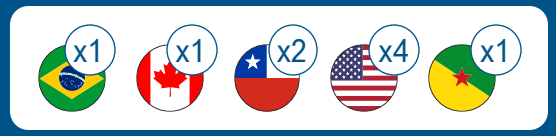
Europe



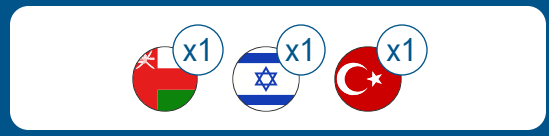
Asia-Pacific



Americas



Middle East & Africa



Note: Only considering Hydrogen Valleys participating in the Mission Innovation Hydrogen Valley Platform

Clean Hydrogen Partnership

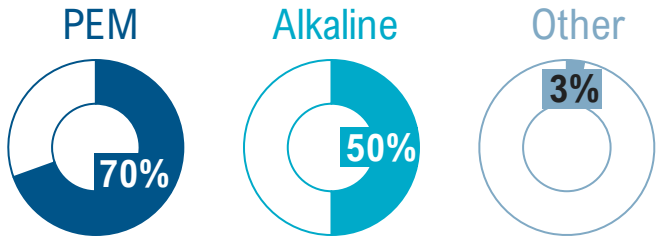
Hydrogen Valleys focus on green H_2 for various end-uses in mobility, industry, and energy sectors

Upstream

~ 8.5 mt

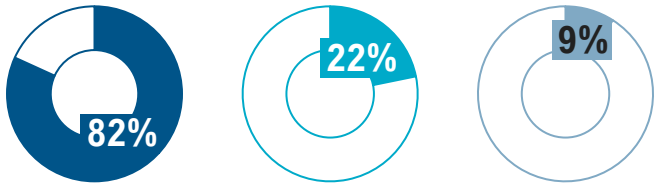
annual green hydrogen production volume[1)]

Electrolyzer technologies

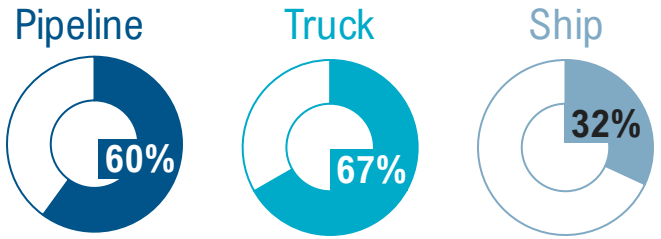


Midstream

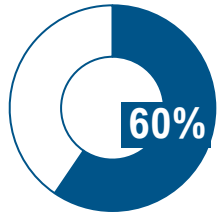
Storage (mainly compr. gas. H_2)



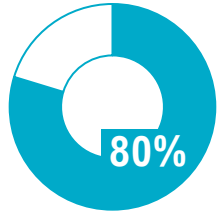
Transportation



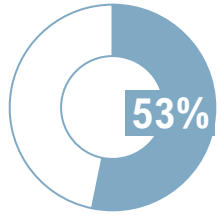
Downstream



Industrial off-takers (esp. chemical industry, refineries and steel)



Mobility end uses (mainly buses, trucks and cars)



Energy end uses (esp. grid injection and gas-fired power plants)

1) After reaching maximum build-out stage

Do you represent a Hydrogen Valley? Join us now!

What defines a Hydrogen Valley?

- Clean hydrogen production
- Larger in scale (double-digit EUR m investment)
- Supply of more than one end use
- Broad value chain coverage
- Geographically defined scope
- Project feasibility

How to join the platform

1. Reach out to H2V@clean-hydrogen.europa.eu with a first introduction of your Hydrogen Valley
2. After initial screening, you are invited to an online survey on your project fundamentals – All information is treated confidential!
3. After submission, your Hydrogen Valley profile is published on the platform – Welcome to the community!
4. You continue to have full control – You can adapt or update your project information at all times

All projects displayed on the platform are welcome to use the MI Hydrogen Valley certificate

Clean Hydrogen Partnership

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For further information

www.clean-hydrogen.europa.eu
www.hydrogeneurope.eu
www.hydrogeneurope.eu/research