



Promoting R&I in Hydrogen: Opportunities for Cooperation between the EU and Japan

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REPOWEREU TO CUT OUR DEPENDENCE ON RUSSIAN GAS



More rooftop solar panels, heat pumps and energy savings to reduce our dependence on fossil fuels, making our homes and buildings more energy efficient.



Decarbonising Industry by accelerating the switch to electrification and renewable hydrogen and enhancing our low-carbon manufacturing capabilities.



Speeding up renewables permitting to minimise the time for roll-out of renewable projects and grid infrastructure improvements.



Doubling the EU ambition for biomethane to produce 35 bcm per year by 2030, in particular from agricultural waste and residues.



Diversifying gas supplies and working with international partners to move away from Russian gas, and investing in the necessary infrastructure.



A Hydrogen Accelerator to develop infrastructure, storage facilities and ports, and replace demand for Russian gas with additional 10 mt of imported renewable hydrogen from diverse sources and additional 5 mt of domestic renewable hydrogen.



An ambitious strategy for Europe

The path towards a European hydrogen eco-system step by step :



Today - 2024

From now to 2024, we will support the **installation of at least 6GW of renewable hydrogen electrolyzers in the EU**, and the production of **up to 1 million tonnes** of renewable hydrogen.

2025 - 2030

From 2025 to 2030, hydrogen needs to **become an intrinsic part of our integrated energy system**, with at least 40GW of renewable hydrogen electrolyzers and the production of **up to 10 million tonnes** of renewable hydrogen in the EU.

2030 -

From 2030 onwards, **renewable hydrogen will be deployed at a large scale** across all hard-to-decarbonise sectors.

R&I support to hydrogen policy

- Horizon Europe:
 - *Public / private partnerships: CH JU, transport and industry partnerships*
 - *Public / public partnership: Clean Energy Transition co fund*
 - *Cluster 5 and 4 collaborative projects*
 - *EIC*
 - *EIT KIC InnoEnergy*
- H2020: Green Deal call
- ERA : Pilot on Green Hydrogen and SET Plan revamping
- Mission Innovation – *Mission on clean hydrogen*

Building an R&I ERA on hydrogen & SET Plan

- Council Conclusions on the New ERA Dec. 2020 invited MS + Commission to start a pilot initiative on green hydrogen.
- Cooperation with MS strengthened through ERA Action 11
- Action 11 includes an ERA thematic pilot on green hydrogen (action 11.1)+ the revamping of the SET Plan (Action 11.2)

ERA Action 11.1 ERA Pilot on Green Hydrogen

- Joint work of MS and Commission in the agenda process for the ERA Pilot
- Task force produced a SRIA, now to be developed into an implementation Plan. SRIA presented at a big Conference on 16 May 2022.
- *Work organised in thematic workshops, public consultations & final conference part of the agenda process*
- *Central thematic blocks:*
 1. *transport / infrastructure (coordinator: Germany)*
 2. *production (coordinators: Bulgaria and Italy)*
 3. *market stimulation (coordinator: Austria)*

ERA Action 11.1 ERA Pilot on Green Hydrogen

For the part at EU level, the Commission issued a Staff Working Document on “Building a European Research Area for clean hydrogen - role of EU R&I investments to deliver on EU’s Hydrogen Strategy” (2022 /15 final).

Objectives:

- Getting an overview on related EU R&I initiatives
- Identifying improvements needed
- Developing synergies with Member States’ part of the agenda process on R&I pilot on Hydrogen

SWD proposed domains of action

- An ERA for uptake to market: Open Innovation Testbeds
- An Era of data: the EU Clean Hydrogen Observatory
- An ERA for skills: the new project under ERASMUS +
- Hydrogen valleys
- Reinforced connection with international frame

ERA Action 11.2 REVAMPING of the SET Plan

SET plan – what is it?

- Technology pillar of the EU's energy and climate policy
- 10 priority actions covering areas of sustainable energy + nuclear safety
- EU Member States + Associated Countries (Iceland, Norway and Turkey)

ERA Forum

- Members are EU Member States plus EEA/EFTA countries

ERA Action 11

- An ERA for Green Energy Transformation
- Expanding EC knowledge and capacity in sustainable energy production and in providing suitable energy carriers and storage (as clean hydrogen)

Contribution to REPowerEU

Revamping the SET Plan

- SET Plan: “strategic policy framework enhancing MS cooperation in energy transition”
- Powerful and successful, however SET Plan needs revision in order to:
 - Adjust to the new policy landscape - support the Green Deal policies and strategies (**incl. hydrogen**)
 - Support the ERA Policy Agenda and reinforce synergies with national / regional levels in the R&I landscape
 - Accelerate innovation and deployment
 - Further address environmental and societal aspects
 - Increase the ambition and visibility of the SET Plan for a higher impact
 - Enhance monitoring of SET Plan progress

Clean Hydrogen JU

- Clean Hydrogen JU: Increased budget while putting a priority on two pillars: production & storage and distribution:
 - JU EUR 2Bn of public/private investment
 - HE Cluster 5 allocates EUR 50 million from the 2022 budget + EUR 150 million until 2025 to the **Catalyst** fund, which includes clean H2 among the 4 priorities
- **Ensuring synergies with PP dealing with hydrogen applications**, including through joint calls, coordinated calls, subsequent calls
- Clean Hydrogen Research and Innovation Day (new SBA requirement) as part of hydrogen week

Clean Hydrogen JU priorities

SRIA Scientific priorities matched by the AWP 2022:

- Renewable **Hydrogen production** (77 M EUR R&I Investment main focus on electrolyzers + 25 M EUR for Hydrogen Valleys) = 33.5% total budget
- **Hydrogen storage and distribution** (49 M EUR R&I Investment) = 16.3% total budget
 - **Hydrogen end uses:**
 - ❖ **transport applications** (98 M EUR) = 32.6 % total budget – Aviation and Maritime
 - ❖ **Clean heat and power** 24.5 M EUR = 8.1% of total budget
 - **Cross-cutting activities** including Hydrogen Valleys (52 M EUR) = 17% of total budget

CH JU International Cooperation

Support the Commission and focus on the multilateral dimension, including through technical expertise, in its international initiatives on the hydrogen strategy:

- International Partnership for Hydrogen Economy and fuel cells in the Economy (IPHE)
- Mission Innovation (Clean Hydrogen Mission)
- Clean Energy Ministerial (CEM) Hydrogen Initiative

Contribute to the development of regulations and standards – elimination of barriers, supporting interchangeability, inter-operability, and trade across the internal market and globally

Strengthening EUs cooperation with Africa – green H2 win-win

Clean Hydrogen JU AWP Call 2022

Call published on 28 February; total of 41 topics

- EU Info Day 15th March; several National Info Days have taken place (ES,PT,HU, PL, SL,FR) + other info sessions

Call 2022-1

- Deadline: 30 May 2022
- Central Evaluations: 4-12 July;
- GAP: as of September; deadline for GA signature: 31 January;

Call 2022-2

- Deadline:20 Sep 2022

AWP 2022

Renewable Hydrogen Production

Main Focus

- Cost reduction and efficiency increase for renewable hydrogen production routes:
- New electrolyser designs for high pressure operation
- Larger cell electrolyser stacks
- Large scale electrolysers in industry, off-grid and offshore
- Improved efficiency solar thermochemical H₂ production

What is new

- Circularity by design
- Improved electrolyser manufacturing

AWP 2022

Hydrogen Storage and Distribution

Main Focus

- Improved hydrogen carriers
- Preparing hydrogen refueling stations for the demands of Heavy-Duty applications
- Scaling-up innovative hydrogen compression solutions

What is new

- Next generation liquefaction units and large scale liquid H₂ storage for shipping
- Developing increased capacity tube trailers
- Improving quality control for Hydrogen dispensed in HRS

AWP 2022

Hydrogen End Uses Transport



Main Focus

- Adaptation of key FC system components for heavy duty applications
- Push toward aviation propulsion: upscaling stack and LH2 storage
- Bringing the learnings from first demonstrations (inland vessels and trucks) to fleets

What is new

- Large scale demonstration of trucks
- Decarbonisation of the inland waterways
- Cooperation with Connecting Europe Facility for Transport work programme

AWP 2022

Clean Heat and Power Overview



Main Focus

- Cost reduction through manufacturing
- Fuel and technology diversification
- Enhanced system flexibility

What is new

- Automation of manufacturing, equipment manufacturers at the core of the action
- Gas turbines running on 0-100% H₂ in gas

AWP 2022

Cross-cutting Issues: Strategic Research Challenges



Main Focus

- Raise public awareness and trust towards FCH technologies
- Safety-related aspects of (i) Cryogenic H₂ transfers for mobile applications, (ii) H₂ injection management at network-wide level
- Test methods and requirements for measuring devices in the gas network
- Support cooperation with the African continent

What is new

- Guidance for raising awareness and trust in the public and key stakeholders in Europe
- Addressing safety aspects on (i) new distribution applications, and (ii) network management
- Test methods and limits and tolerances for currently used devices
- Shape future cooperation with African countries on renewable H₂ tech



Hydrogen Valleys Overview

Main Focus

- Deploy and demonstrate large and small scale hydrogen valleys that can be sustained and grow with time and replicated elsewhere
- Covers the complete value chain of hydrogen
- Contribute to EU competitiveness by supporting a European value chain
- Hydrogen as an enabler for sector coupling and integration of renewable energy

What is new

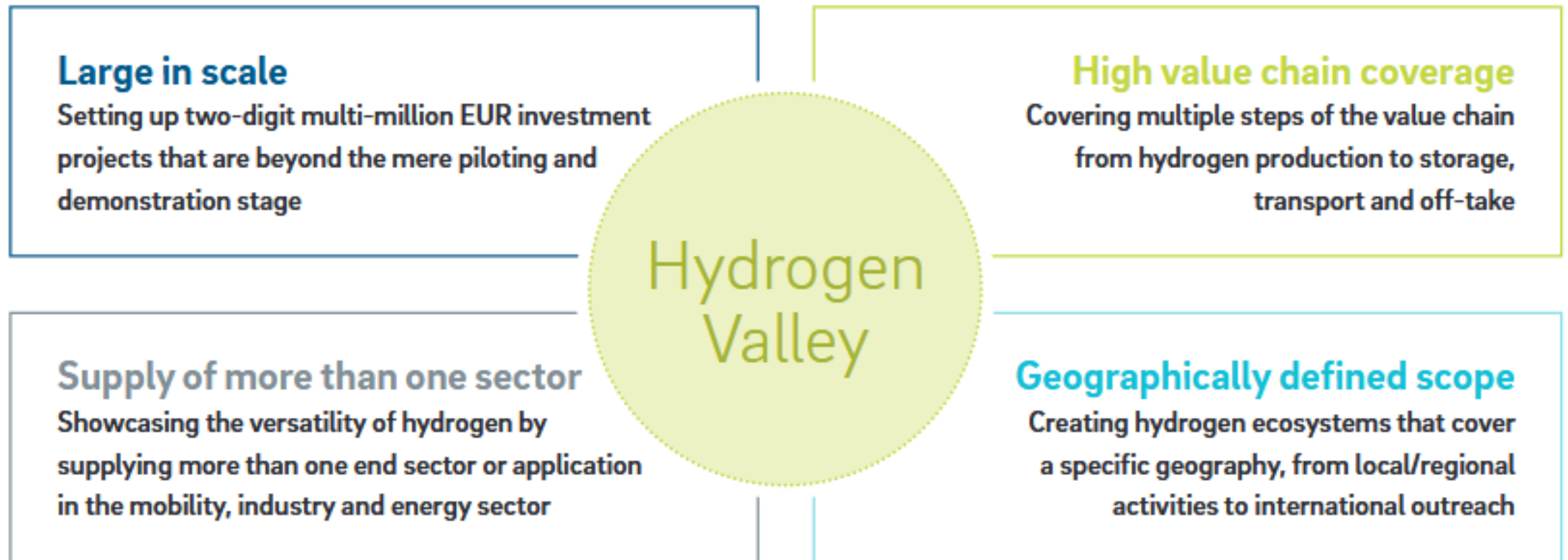
- Large-scale: interlinkages beyond the individual H₂ Valley boundaries as a means to contribute towards an EU hydrogen infrastructure backbone
- Smaller-scale: Stimulate Hydrogen Valleys in areas of Europe with no or limited presence

Hydrogen valleys: Key points

- Different H2Vs archetypes to be considered (avoid “one size fit all” approach) – all size and scales are possible depending on the nature of the area/scope/needs
- Integrated approach across the entire value chain from R&I to deployment – for H2 RE production to final use
- Could cover industrial nodes but much more: transport nodes with other applications, mixed uses (housing, industry, transport, etc..) – full flexibility as long as it covers more than one single domain of application and more than one part of the value chain
- Rolling out the hydrogen valley concept (from small scale to large scale) will put pressure on the production capacity of electrolysers
- REPowerEU now asking to increase budget for Hydrogen Valleys in the EU
- Mission Innovation supporting developing Hydrogen valleys worldwide

Hydrogen Valleys Archetypes

A: What makes a Hydrogen Valley



Hydrogen Valleys in Europe www.h2v.eu

23 Hydrogen valley's identified in 10 EU countries + U.K.

 3 in The Netherlands:

- North Netherland
- Zuid Holland
- Zeeland (H2 delta)

 2 in U.K.:

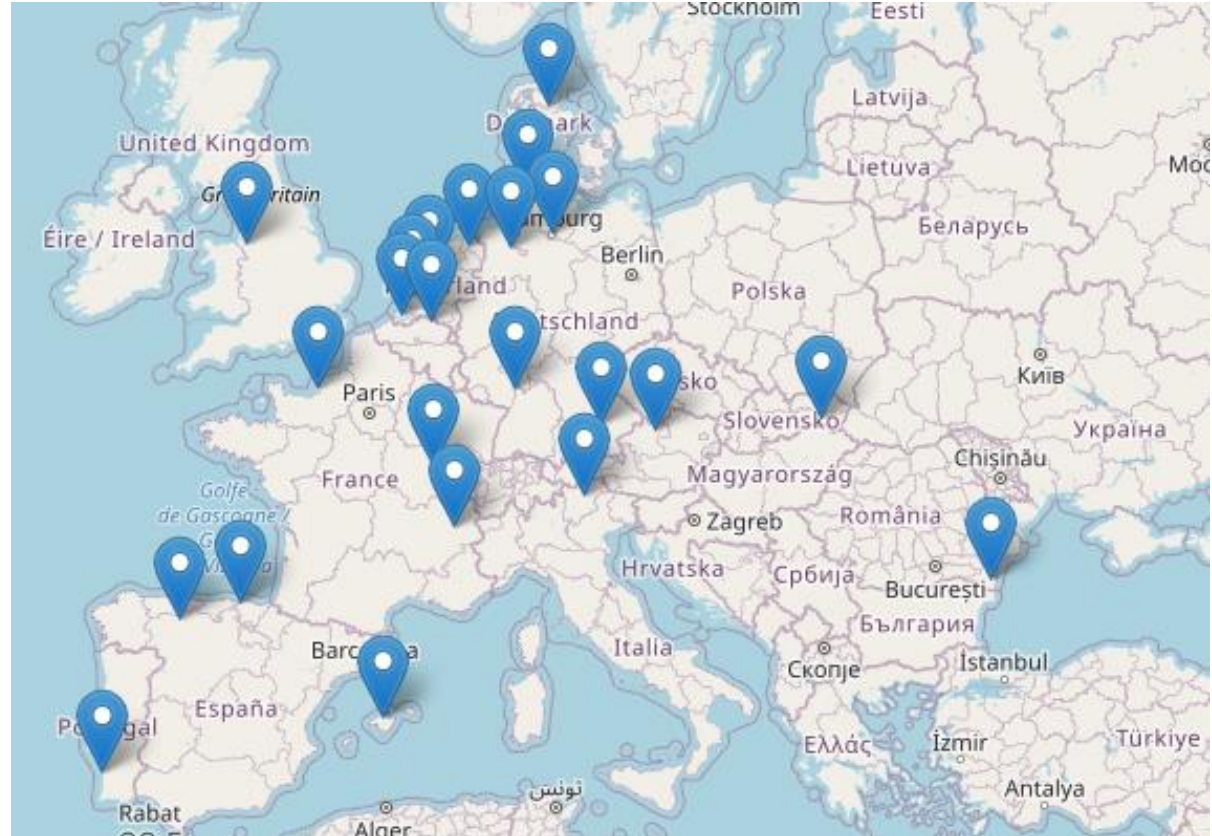
- North West England
- Orkney Islands


 4 in France:

- Rhone Alpes
- Normandy
- Bourgogne Franche Comté
- French Guiana

 1 in Portugal:

- Sines industrial hub



 3 in Spain:


- Island Mallorca
- Basque (BH2C)
- Green Crane

 1 in Italy:

- Bolzano

 1 in Austria:


- Linz (WIVA)

 1 in Denmark:

- Hobro (Hybalance)

 5 in Germany:

- Munich (Hybayern)
- Mannheim (H2rivers)
- Heide (eFarm)
- Hamburg (NDRL)
- Oldenburg (HyWays)

 1 in Slovakia:

- Kosice (Black Horse)

 1 in Romania:

- Constanza (Blue Danube)

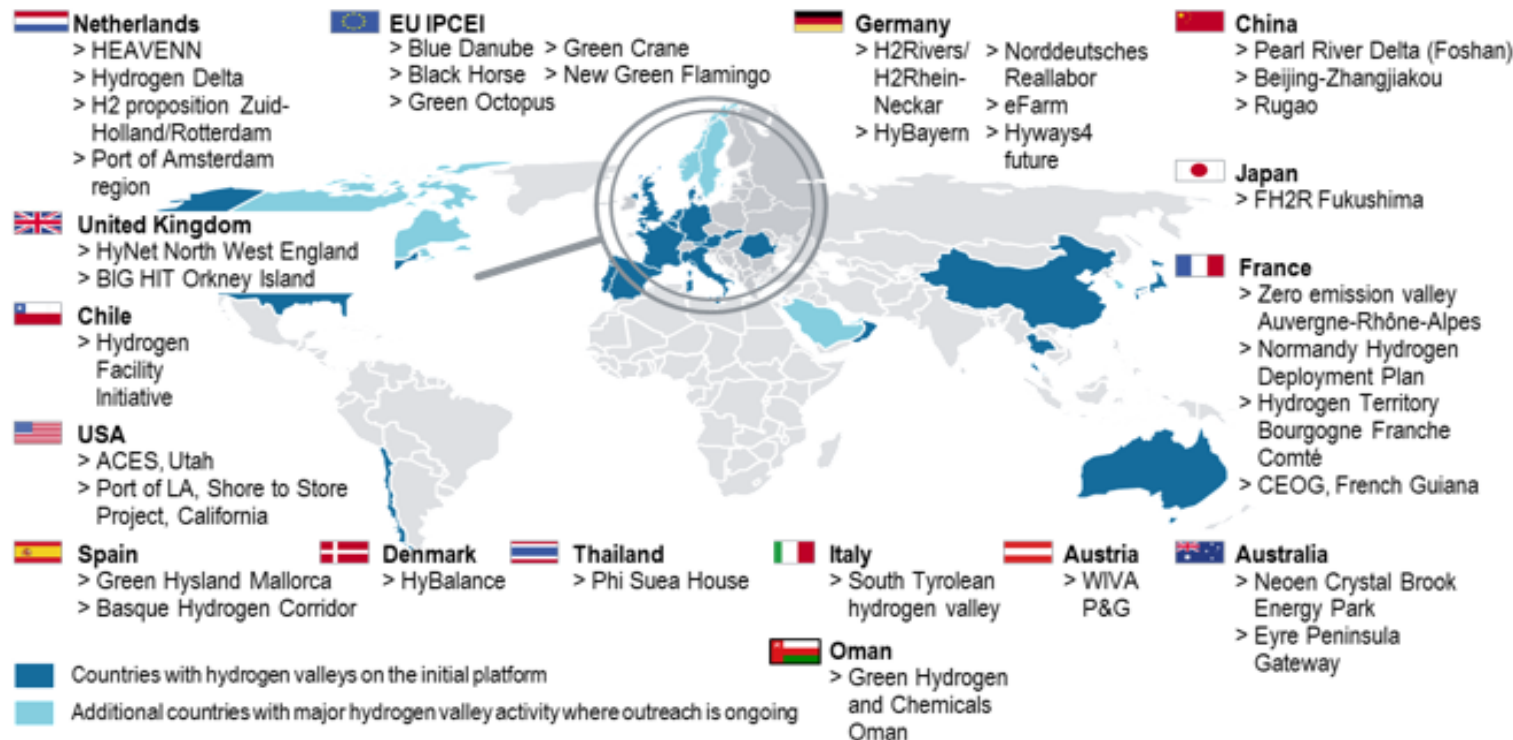
Hydrogen Valley: a EU Priority



Hydrogen valleys have become a global theme

Integrated projects are emerging all around the world and sharing lessons learned to accelerate the energy transition

A fast-growing landscape of globally leading projects ...



... featured on the new platform

-  > 34 valleys from 19 countries
-  > 3,500 data points
-  10 in-depth best-practice profiles

THANK YOU!

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