

Promoting Hydrogen Deployment in **Regions and Valleys**

Pedro GUEDES DE CAMPOS

EUROPEAN HYDROGEN VALLEYS 27/10/2022

EUROPEAN PARTNERSHIP







1. H2V: Clean Hydrogen (JU) in action and its alignment with Climate **Policies**

2. PDA – Project Development Assistance (I & II)



3. Mission Innovation 2.0 - H2Valley Platform

4. Main take-aways







Hydrogen Valleys (H2V) - from RES to H2 off-take

Boost a new market by enabling Sector coupling, in a regional set up, to de-risk project deployment across the value chain

European Green Deal (11/12/2019)

- European Industrial Strategy (10/03/2020)
- Recovery Plan for Europe (28/05/2020)
- Hydrogen Strategy (08/07/2020) Ely: 6GW-2024; 40GW-2030
- Energy Integration Strategy (08/07/2020)
- Clean Hydrogen Alliance (08/07/2020)
- Fit for 55 (14/07/2021)
- Gas Decarbonisation Package (15/12/2022)
- **REPowerEU plan** (18/05/2022) 10Mt domestic RES H2 + 10Mt imported RES H2 by 2030 Double H2V (~50) -> EUR 200 mn (extra until 2025) H2 accelerator -> build 17.5 GW electrolysers by 2025

Clean Planet for 2050 All: net-0 GHG

NECPs' targets Fit-4-55

REPowerEU plan

55% CO₂ reduction 2030 **45%** Renewables 36% final and 39% primary **Energy Eff**

> **PDA I** (2020) – 11 direct support (up to total CAPEX of EUR 750 mn); 24 Observer regions

5 H2Valley projects -2016; 2019; 2020; 2022 (2x)

PDA II (2022) – 15 regions; Observer network

MI2.0 H2V Platform

H2 Territories Platform (HTP)

Regions' Hub

European H2V Partnership (S3)

FCH Regions

Initiative

(2016 - 2018) -92 MoUs; 1 study; Mobility business case tool; Tech dossiers; etc.

EUROPEAN PARTNERSHIP

REPowerEU plan for H2Valleys

- 3 years of full support, targeting 50 H2V in EU by 2025 (EUR 200 mn)
- Gas Decarbonisation Package – sets clear and stable legal framework for H2V until 2030 (regulatory waiver) and beyond (unbundling)
- Mapping of H2V potential, its Stakeholders and creating a coherent pipeline to meet EU goals

Support and feedback to EU and MS Policies regarding a resilient and sustainable energy transition

Targeted action to achieve highest impact of taxpayers money

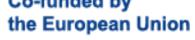


Synergies

- Technical Assistance to Member States & **Regions** (accelerate deployment; mobilise investment/ co-funding)
- Seal of Excellence (H2V topics in 2022)
- Top-up by Member **States**
- Complementary funding from other R&I&D-relevant EU, national or regional programmes (e.g. CEF, ERDF, RRF, JTF)

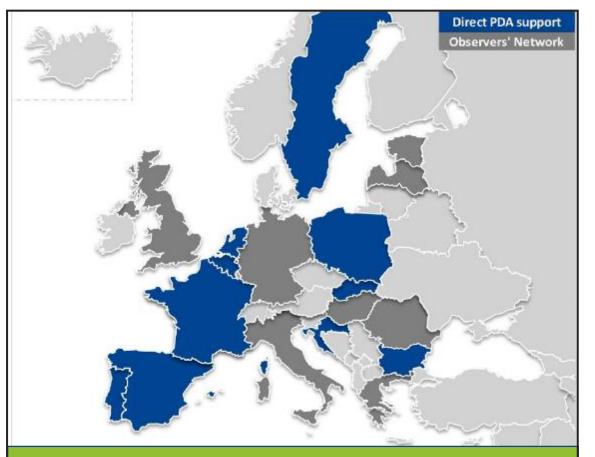






The JU's region initiative was key to boost H₂ awareness in EU Clean Hydrogen Partnership The ~100 regions initiative led to the PDA, H2 Valley partnership and funding of H2Valley topics https://www.clean-hydrogen.europa.eu/get-involved/fch-regions-hub-0_en

(1) Project Development Assistance (PDA)



Great opportunity to bring on-board and share learnings with 'less FCH ready' but higly interested central and eastern European regions

Q2 2022 another PDA launched; focus on Cohesion countries, outermost regions and islands

(2) EU H₂ Valleys Partnership

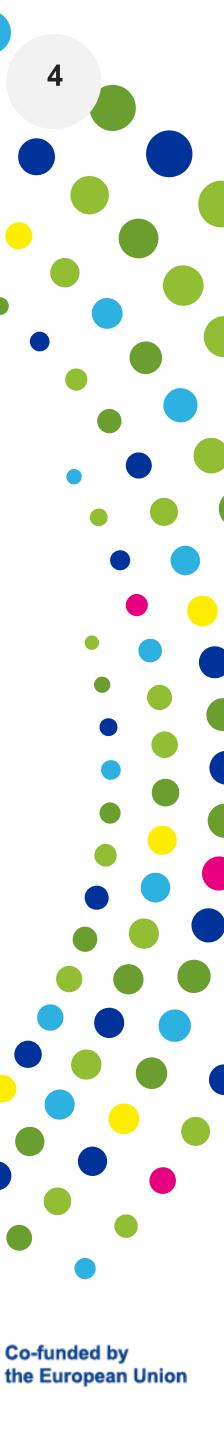


http://s3platform.jrc.ec.europa.eu/hydrogen-valleys

(3) Creation of H_2 valleys



"I want Next Generation EU to create new European Hydrogen Valleys to modernise our industries, power our vehicles and bring new life to rural areas."



Definition of a Hydrogen Valley

Used in the call topics and the Mission Innovation platform

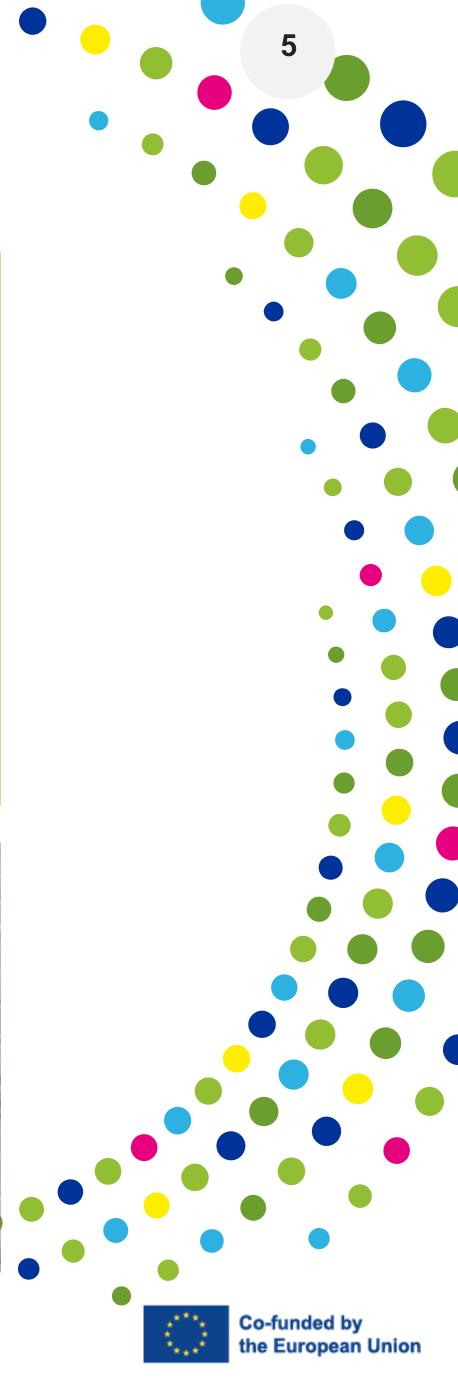
A Hydrogen Valley is a <u>defined geographical area</u> where hydrogen <u>serves more than one end sector</u> or application in mobility, industry and energy. They typically comprise a multimillion euro investment and cover all necessary steps in the <u>hydrogen value chain</u>, from production (and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



Clean Hydrogen Partnership









Procurements relevant to H2Valleys and Regions

PROJECT DEVELOPMENT ASSISTANCE FOR REGIONS (I)

PROJECT DEVELOPMENT ASSISTANCE FOR REGIONS II

MISSION INNOVATION HYDROGEN VALLEYS PLATFORM (I & II)

EUROPEAN PARTNERSHIP





1. H2V: Clean Hydrogen (JU) in action and its alignment with Climate Policies

-01

2. PDA – Project Development Assistance (I & II)





3. Mission Innovation 2.0 - H2Valley Platform

4. Main take-aways





Regions' Hub

Support European Regions and Cities to Launch Investments

https://www.clean-hydrogen.europa.eu/get-involved/fch-regions-hub-0_en

Clean Hydrogen Partnership							
Home	About Us 🗸	Projects	Get involved 🗸	Apply for funding $ \!$	Knowledge management 🗸	Media 🗸	
European Commission > Clean Hydrogen Partnership > Get involved > FCH Regions' Hub							

FCH Regions Hub

.......

Navigation FCH Regions Hub FCH Regions' Hub | Background Info | Latest News and Publications | More >

Supporting European Regions and Cities Hub

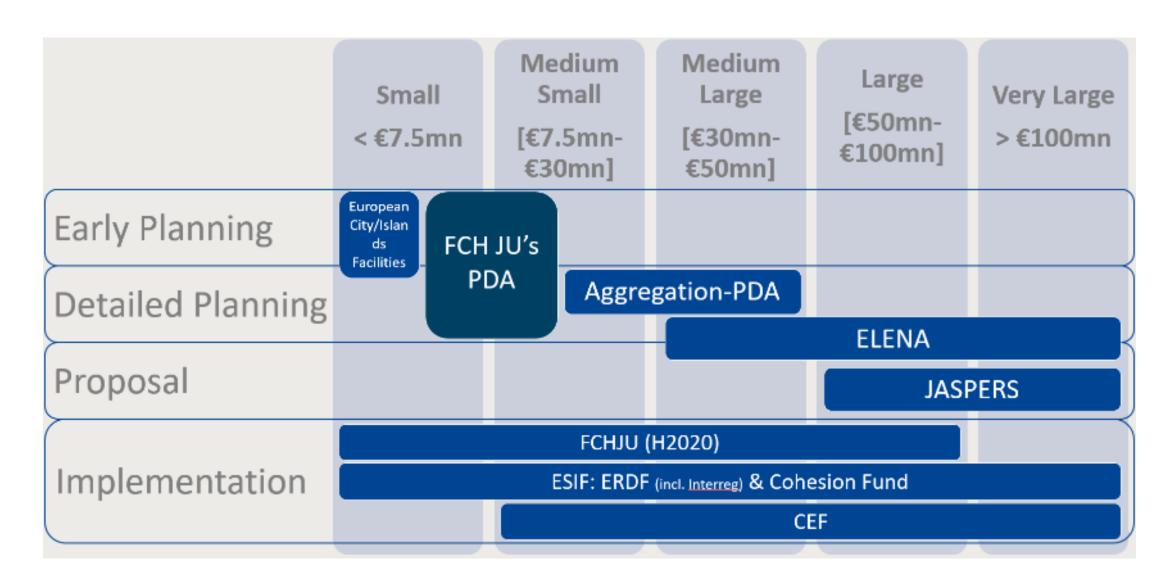
The FCH-Regions' Hub supports regional and local authorities and other public bodies across the European Union to develop and turn their concepts for regional hydrogen and fuel cell (FCH) projects into detailed work plans. Raising awareness and providing project development assistance to regional FCH projects will further accelerate the deployment of hydrogen in Europe, contributing to carbon neutrality and zero pollution.

How the FCH-Regions' Hub Works

The FCH-Regions' Hub concentrates the relevant information we gather within the funded projects, studies and initiatives. It further links you to specific external sources and complementary initiatives capable of assisting you in the endeavour of deploying your Regional FCH plans.

		Туре	Title
Latest News and Publications			
PDA for Regions		Initiative (S3P)	European Hydr
		Initiative	Clean Energy f
Hubs for regions		Platform	Mission Innova
Opportunities for other PDA support	Initiatives to support networking among regions		
Tools to support the development of business models	Reference Studies and Reports	Initiative	Covenant of M movement for e
Demo Projects to access specific expertise on the deployment of different FCH	H2 Islands	Association	CPMR - Confe Regions

EUROPEAN PARTNERSHIP



Туре	Title	Source	Link	Last upda
Technology introduction & preliminary business casses' dossiers	FCH Technology introduction & preliminary business cases' dossiers	FCH Regions Initiative (FCH JU: 2+26 PDF files)	All: - Technology Introduction Dossiers - Preliminary Business Cases Per applications:	
Business cases/models	Business models	Funding and Finance (FCH JU website)	https://www.fch.europa.eu/page/advice-complex-business- models	
Business cases/models	Teaser for Coupling wind farms (or any RES) and Electrolysers	Funding and Finance (FCH JU website)	https://www.h2v.eu/https://www.fch.europa.eu/page/advice- complex-business-models#PtH2	
Modelling tools	Mobility business case tool	FCH Regions Initiative (FCH JU Excel sheet)	Excel file	27/03
Funding tools	FCH Funding and Financing navigation tool	FCH Regions Initiative (FCH JU; Roland Berger; Excel sheet)	Excel file	08/02



drogen Valley Partnership

for EU Islands

vation Hydrogen Valley Platform

Mayors. The world's largest r climate and energy actions

ference of Peripheral and Maritime





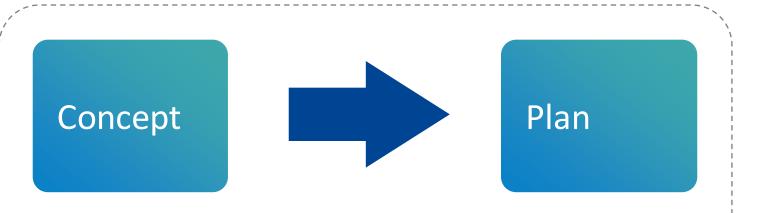
JU's Project Development Assistance (PDA) for Regions

Building a pipeline of H2Valleys allover Europe <u>Final report and summary slides</u> published on 19/10/2021 (<u>closing Webinar</u>)

Project Development (11)

Clean Hydrogen

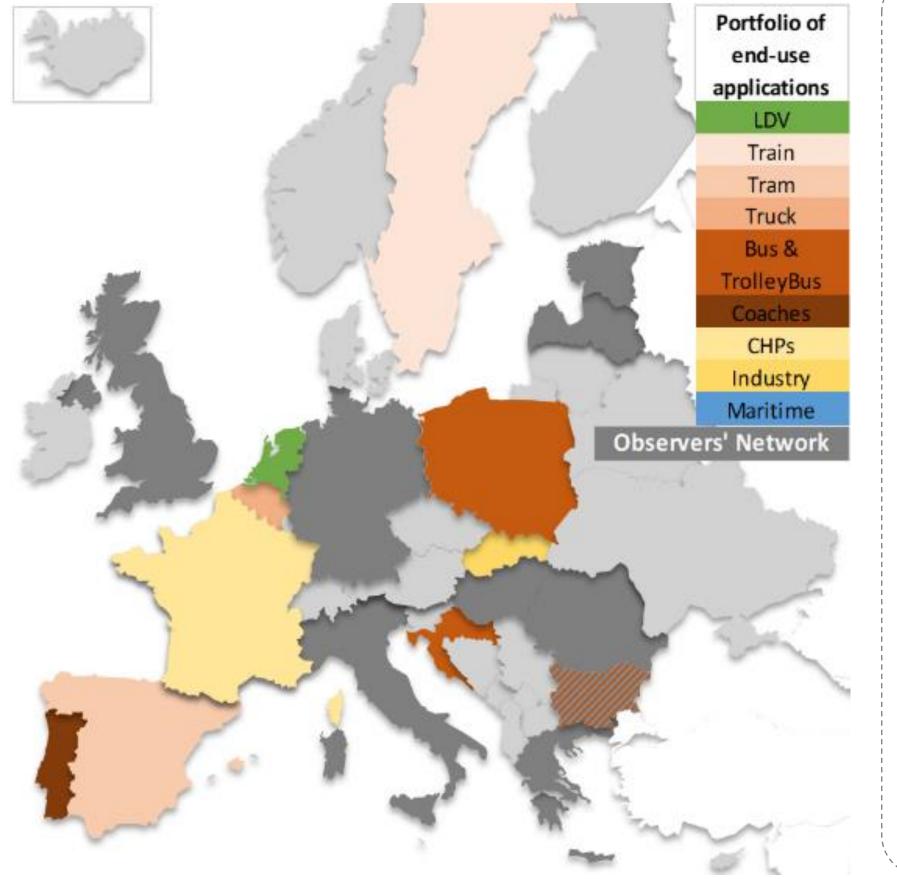
Partnership



- Detailed project budgets
- Detailed project plans
- Financing and funding plans
- Strategies and best practices for procuring H2 tech

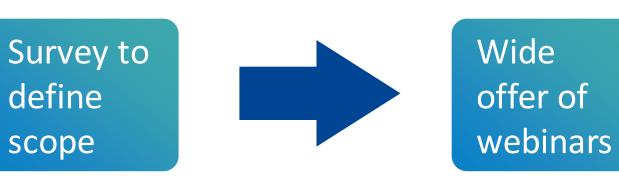
June-2020 – June-2021

PROJECT DEVELOPMENT ASSISTANCE FOR REGIONS





Observers' Network (+24)



Webinars

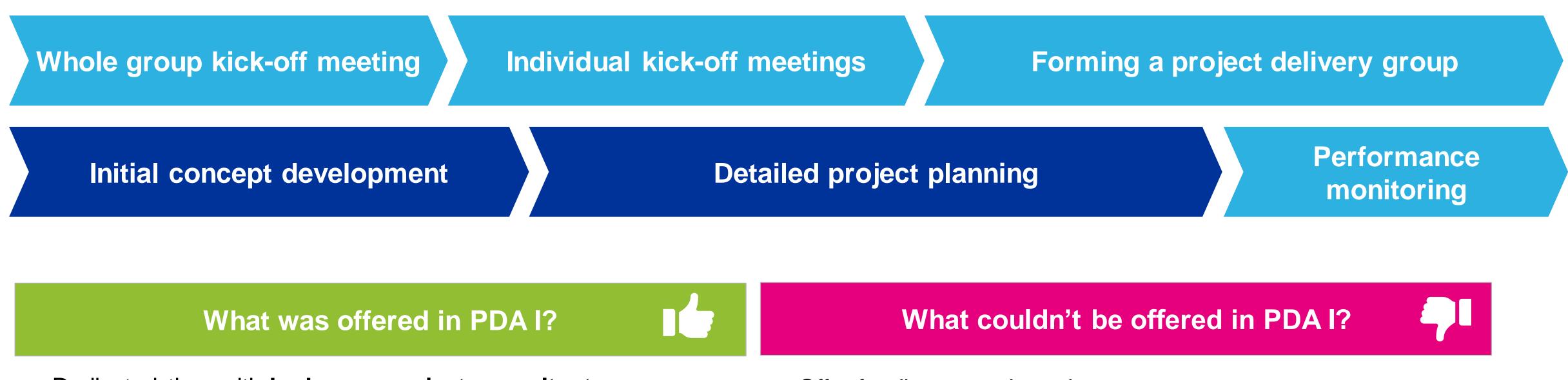
- 1st tech FCH buses and trucks (15/10/2020)
- 1st peer review (17/11/2020)
- Funding & Financing (16/12/2020)
- 2nd tech HRS and H2 distribution (11/02/2021)
- 3rd tech H2 production (26/05/2021)
- Database of suppliers
- Request for Information (template)
- Policy (white paper) support for H2
- FCH Regions' Hub





How was PDA I delivered?

A standardised process but providing a tailored approach to each individual project



- Dedicated time with hydrogen project consultants
- Development of achievable project implementation plans
- **Connecting regions to industry** and technology suppliers
- Coordinating **project delivery groups**
- Budgeting and business case analysis
- Assessing and managing **project risks**
- **Engagement with regulators** to remove policy barriers



- Offer funding towards projects
- Writing of funding applications



What has been learned from PDA I? Key learnings to be carried into PDA II, especially focussing on EU13 countries

Define appropriate project scale to begin the process

Identify and manage language barriers

Use hydrogen projects to drive local economic growth

Offer policy and regulatory support for first deployments

Define criteria for progress after the conclusion of PDA support

business case but remaining feasible for first deployment

Coordinate some meetings in native languages to avoid exclusion of local partners

Identify where business cases are not







111A





- Access more funding opportunities
- Advise on appropriate project scale for a strong







Identity and mitigate project risks at an early stage



Assist with engagement with industry or other stakeholders, where communication in English is required

- Seek opportunities to engage with local industry to develop the hydrogen supply chain and drive local economic growth
- viable without relevant policy support



Gain support from local decision makers



Support engagement with local regulators to identify regulatory barriers



Allow for changes in system design, procurement strategy, and project team after the end of the PDA support



PDA for Regions (I)

The supported regions and their projects. NEXT STEP: Projects' implementation

Limburg (WaterstofNet) Trucks and Logistics 2 trucks, 3 shunters, 2 refuse truck, 3 LCV's €5.9 M CAPEX

Clean Hydrogen Partnership

> Bourgogne-Franche-Comté (Element Energy SARL) Trucks, Buses and HRS **40 trucks, 63 buses** €78.7 M CAPEX

Asturias (Element Energy SARL) Public transports, HRS, H2 production & injection 200 MW onshore and 5 MW offshore electrolyser

Médio Tejo (Element Energy SARL) Coaches, HRS & H2 production 12 coaches

€86 M CAPEX

Zagreb (Element Energy UK and Buses, HRS & H2 production **20 articulated buses** €38-50 M CAPEX

elementenergy



EUROPEAN PARTNERSHIP

Led by:



Led by:

Supported by:



SPILETT



12



Texel (*WaterstofNet*) Mariestad (Spilett) Smart sector-coupling on islands Regional Trains, HRS & H2 **1 MW Electrolyser** production 2 trains, 10 buses €12M CAPEX €22.3 M CAPEX Zagreb (Element Energy UK and Trezors) 60

Supported by:

Gdynia (Spilett and WiseEuropa) Buses, HRS & H2 production **91 buses** €65.9 M CAPEX

Mocenok (Element Energy UK) Electrolysis for Green Ammonia **2 trains, 12 buses** €113.5-124.8 M CAPEX

Ruse (Element Energy UK and Trezors) FC Freight ship **1 freight ship, 10 buses** €23.4 M CAPEX

Sofia (Element Energy UK and Trezors) Buses & HRS 24 buses, 6 inter-city buses, 30 trolleybuses

€46.2 M CAPEX



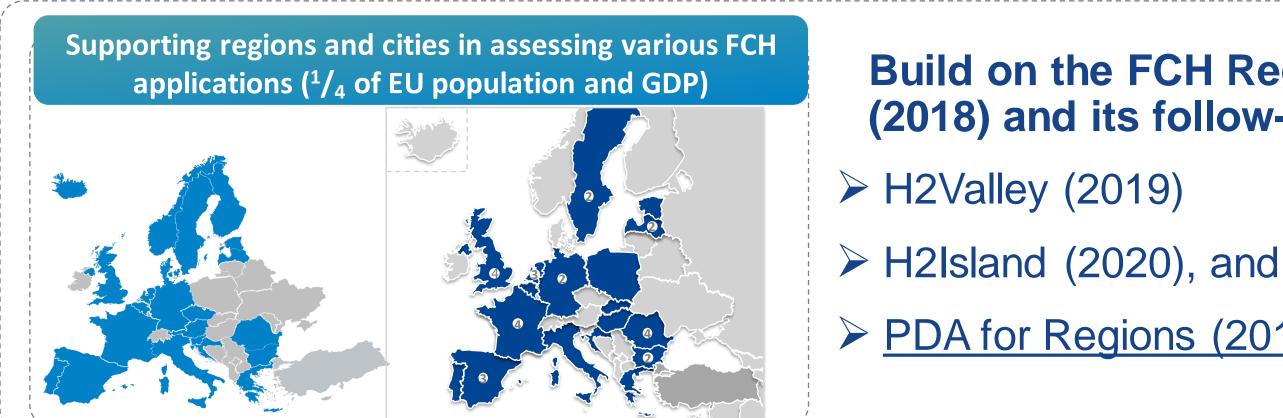
WiseEuropa





PDA for Regions II

Focus on Cohesion Countries, Outermost Regions and Islands



Tasks

Clean Hydrogen

Partnership

- Select at least 15 projects
- Provide PDA support to bring projects to a high level of preparedness
- Create Observers' Network(s) of inter-island, interregional and cross-city networks to generate specific blue prints
- Raise awareness of relevant Regional and National ESIF Managing Authorities and Promotional Bank

Planned Schedule:

- Call for Eol **21/10/2022** (deadline)
- Awarding: **Dec-2022**
- Implementation: 2023

Build on the FCH Regions Initiative (2018) and its follow-up activities:

PDA for Regions (2019-2021)

Support detailed project planning

Explore other geographies

Raise awareness for Funding and Financing community

Outermost Regions

Cohesion Fund eligibility (15 MS)



6+12 month / EUR 1 million



Phasing-out support Other Member States





Co-funded by the European Union

GNI/head figures: average 2008-09-10 Sources: Eurostat, DG REGIO

1. H2V: Clean Hydrogen (JU) in action and its alignment with Climate Policies

2. PDA – Project Development Assistance (I & II)





3. Mission Innovation 2.0 - H2Valley Platform

4. Main take-aways





Hydrogen Valleys have become a global theme

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

E: Global Hydrogen Valley activities and example projects from the Mission Innovation Hydrogen Valley Platform

United Kingdom

- → HyNet North West
- → BIG HIT Orkney Islands

Netherlands

- → HEAVENN
- → Hydrogen Delta
- → Europe's Hydrogen Hub: H₂ Proposition Zuid-Holland/Rotterdam

Belgium

→ Flemish Hydrogen Ports Valley

Germany

- → H2Rivers → HyBayern
- → eFarm
- → Northern German Living Lab
- → Hyways for Future

Italy

- → Hydrogen Valley South Tyrol
- → H2iseO Hydrogen Valley

- Denmark → HyBalance
- Austria → WIVA P&G:
- Hydrogen Flagship Region

Portugal → Sines Industrial Hub

- Spain → Green Hysland
- → Basque Hydrogen Corridor

Japan

→ FH2R Fukushima

China

- → Foshan Nanhai Xianhu Lake Hydrogen Valley Town
- → Zhangjiakou
- Demonstration Project
- → Rugao Hydrogen Energy Town

Thailand

→ Phi Suea House

USA

- → Advanced Clean Energy Storage Project
- → Port of LA, Shore to Store Demonstration Project
- → Wyoming Clean Power Center

Chile

→ Hydrogen Facility Initiative

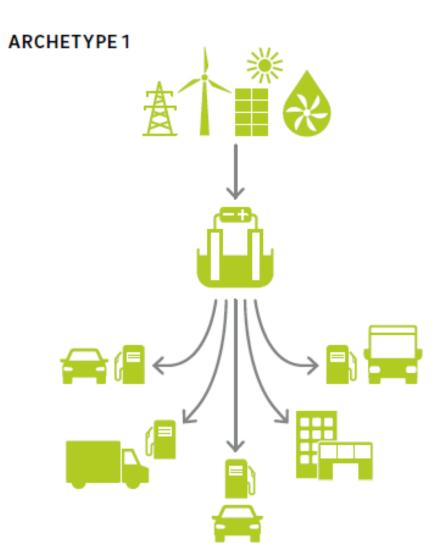
- France
- → Zero Emission Valley
- → Normandy Hydrogen
- → Hydrogen Territory
- Bourgogne Franche Comté
- → Centrale Electrique de l'Ouest Guyanais

Oman

→ Green Hydrogen and Chemicals Oman

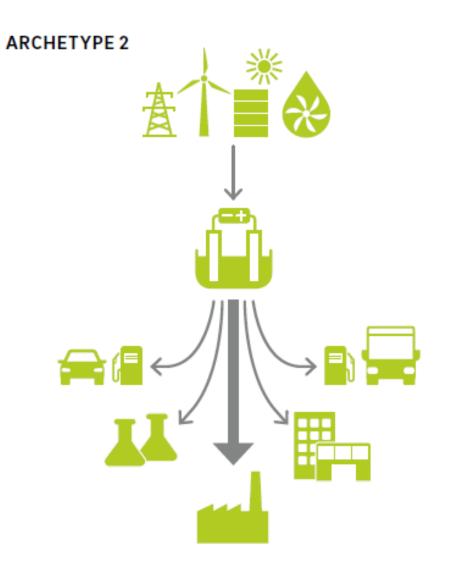
Australia

- → Crystal Brook Hydrogen Superhub
- → Eyre Peninsula Gateway

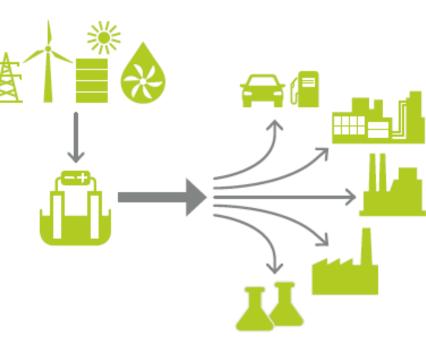


→ Smaller-scale local mobility-centred Hydrogen Valleys (typically 1–10+ MW of local electrolyser capacity)





→ Medium-scale Hydrogen Valleys focusing on industrial decarbonisation (typically 10-300+ MW of local electrolyser capacity)



→ Large-scale and ultimately export-oriented Hydrogen Valleys (typically 250-1,000+ MW of local electrolyser capacity)





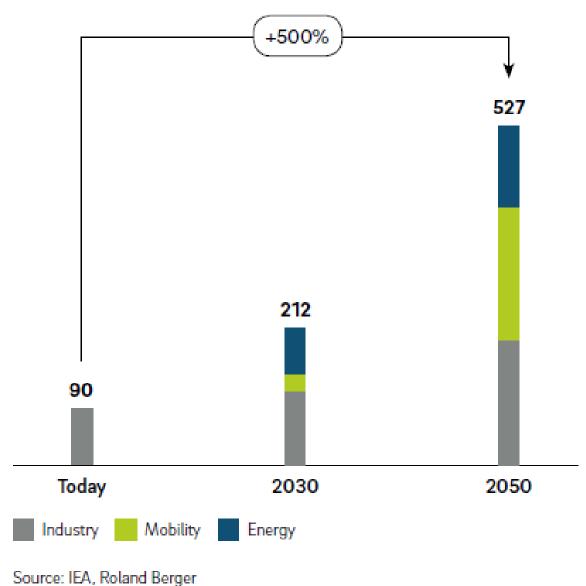
www.h2v.eu

ARCHETYPE 3

Co-funded by the European Union



A: Hydrogen consumption in the IEA's Net Zero Emission Scenario [Mt]



¹⁰⁰ EU's REPowerEU Package incl. a "Hydrogen Accelerator", in response to the war in Ukraine: → 10 mt of annual domestic renewable production by 2030 65 (+100% of previous target), plus an additional 10 mt of annual renewable hydrogen imports → Trigger the necessary electrolyser build-out of 65–100 GW by 2030 (depending on capacity factor assumptions)¹ → Increase EU electrolyser manufacturing capacity tenfold to 17.5 GW p.a. by 2030 10 10 6.5 5 2.5 EU Commission Germany Italy Spain Netherlands Poland United Kingdom² France Portugal

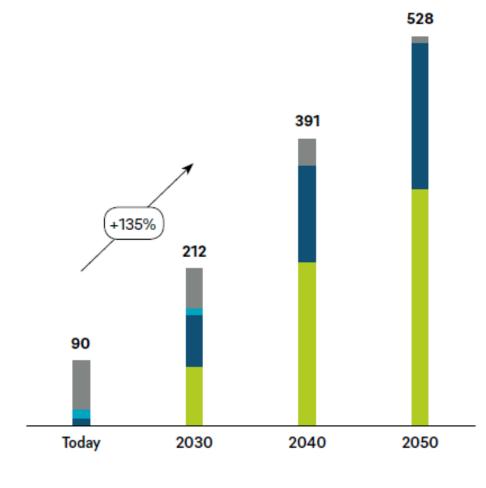
C: National electrolyser capacity targets for 2030 in major European economies [GW]

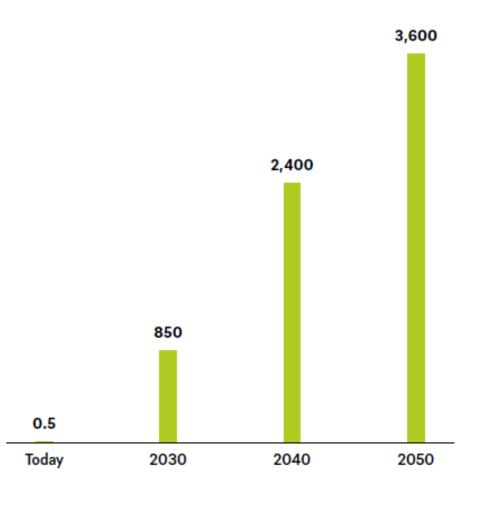
1) The range reflects varying assumptions on capacity utilisation factors and efficiencies underlying the EU green hydrogen production targets. 2) Including installed capacity for production of low-carbon hydrogen

Source: European Commission, national governments, Roland Berger

NEED FOR GLOBAL H₂ SUPPLY [Mt]

REQUIRED ELECTROLYSER CAPACITY [GW]





Fossil fuels refining CNR¹ with CCUS² Electricity

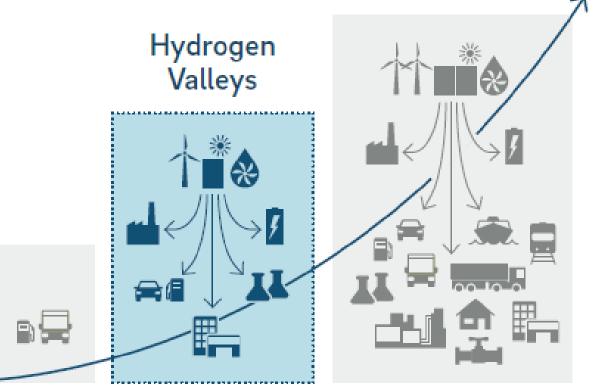
Source: IEA, Roland Berger

1) Catalytic Naphtha Reformer 2) Carbon Capture (Utilisation) and Storage

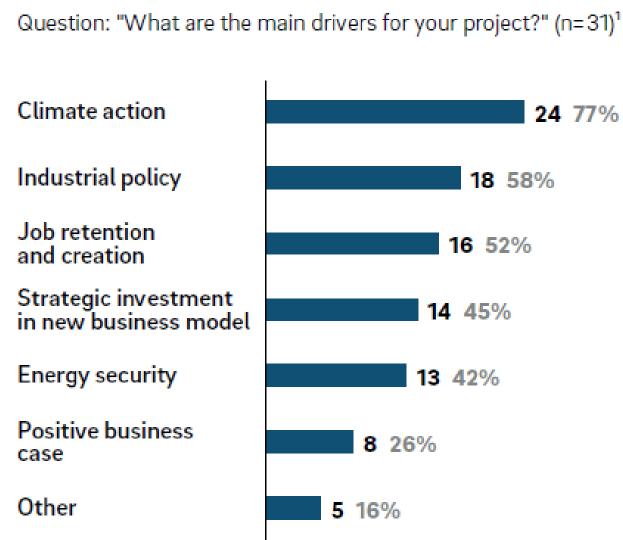
D: Hydrogen Valley project drivers

THE AMBITION

- → Next-generation market development
- → Integrated (and larger-scale) projects covering more and more of the value chain - "mini hydrogen economies"



THE UNDERLYING DRIVERS









Next steps under MI 2.0:

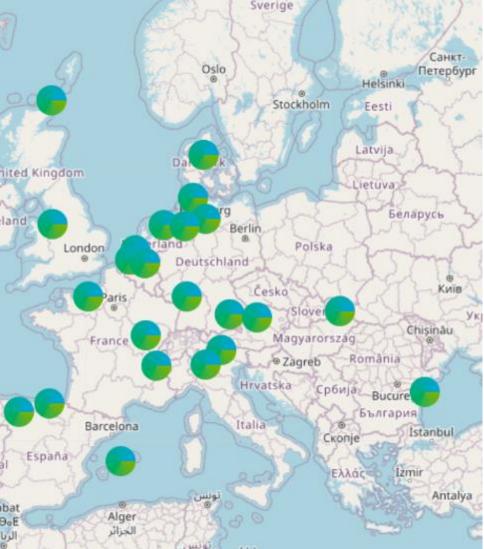
- Further development and enhancement of the MI Hydrogen Valley Platform
- Target of 100 Hydrogen Valleys and minimum three in each member country by 2030

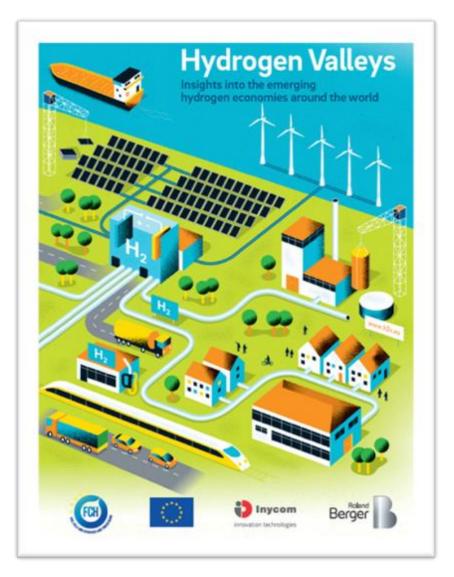


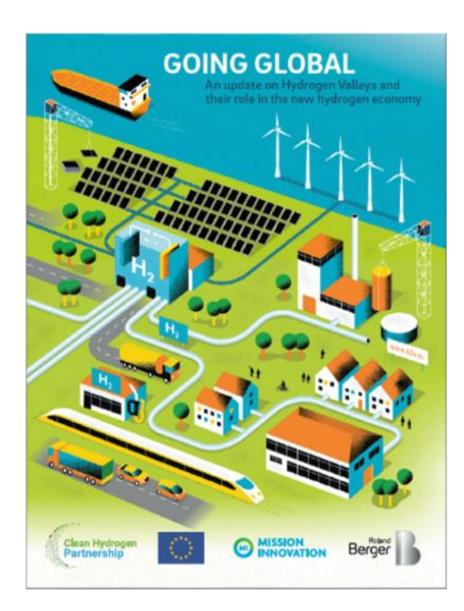
Key remaining barriers for Hydrogen Valleys

- > Obtaining public funding support to close the remaining funding gaps
- > Finding green hydrogen off-takers and signing long-term contracts to make projects bankable
- > Ensuring technology readiness of all fuel cells and hydrogen applications required
- > Ensuring adequate legal regulatory support (carbon pricing, standardization, fast permitting, etc.

EUROPEAN PARTNERSHIP













Mission Innovation Hydrogen Valley Platform

owcasing hydrogen flagship projects around the rld: A platform for project developers Shov wor

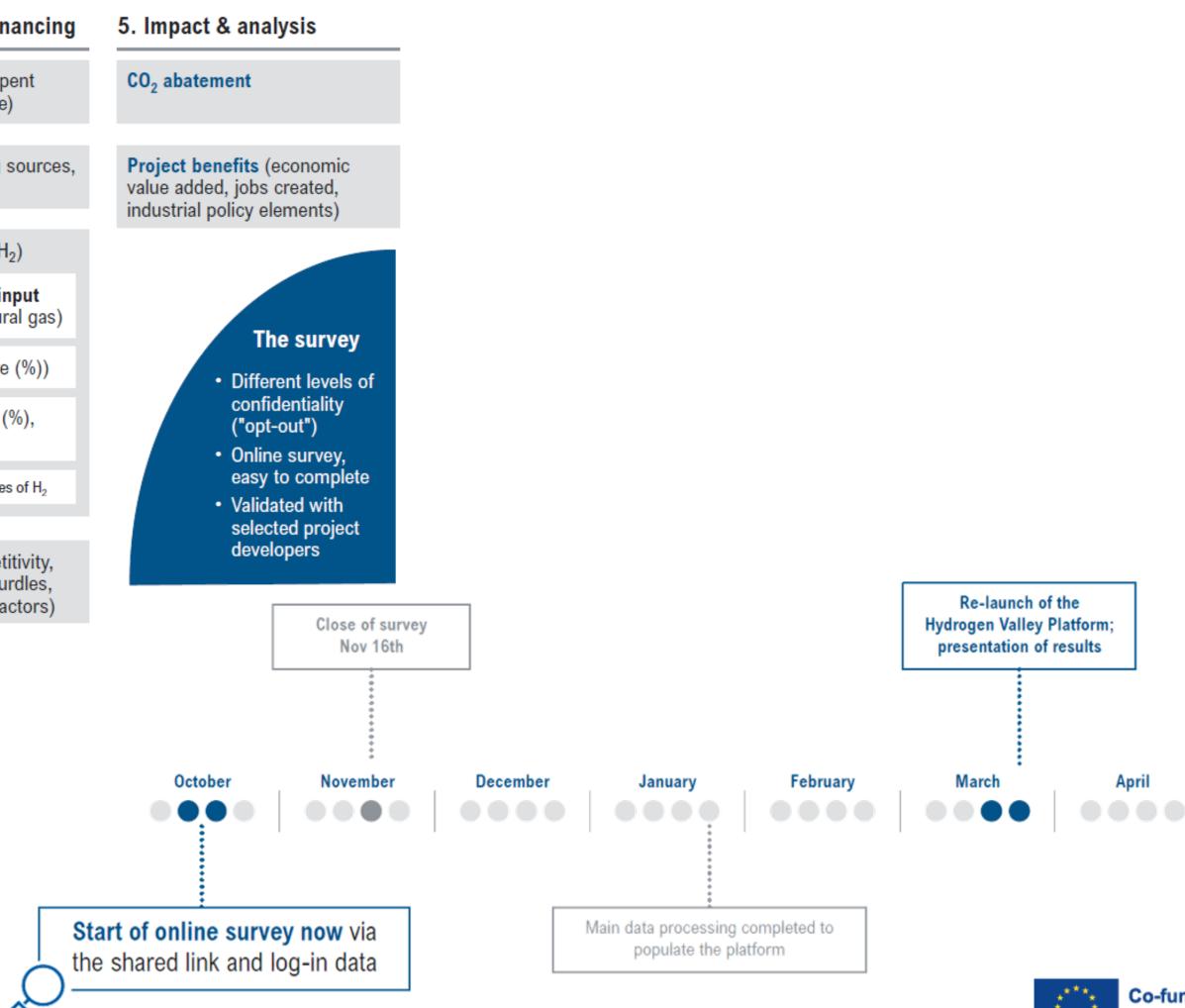
Key topics of the survey

1. Project fundamentals	2. Value chain & technologies	3. Preparation & execution	4. Commercials & fina	
Key project facts (contact, website, short description)	Technologies along the value chain	Timeline (planned time vs. actual, permitting)	CAPEX (total budget, speebudget, overhead share)	
Location (country, city, geo- coordinates, second location,	Primary energy sourcing (renewables, natural gas, etc.)	Parties involved (stakeholders, staff members)	Funding (main funding so instruments, duration)	
covered area/region)	H ₂ production (electrolysis incl. tech, SMR+CCUS, etc.)	,	LCOH (seles prices of H	
Stakeholders (lead developer, partners, sponsors, project		Preparation funding (budget, funding source for preparation)	LCOH (sales prices of H ₂) Anticipated average inp	
connections, new joiners)	H ₂ storage / conversion (cylinder, cavern, ammonia)	Governance (lead entity, risk sharing mechanism, governance mechanism)	costs (electricity, natura	
Production and end uses (capacity, volumes,	H ₂ transport / distribution (pipeline, truck, ship, HRS)		Green H ₂ (costs, share (
consumption, offtakers)	(pipeline, track, emp, me)	Permitting (Regulatory provisions / hurdles, clarity on procedures, status)	Blue H ₂ (costs, share (% CCUS, capture rate)	
Investment and team (total investment, staff members)	End-use applications (mobility, energy, industry)		Other zero/low-carbon sources of	
Motivation and timeline (main		Rest practices (activities	Rest practices (compatiti	
Motivation and timeline (main drivers, start date, exp. COD, status, planned expansions)		Best practices (activities, hurdles, barriers, key success factors)	Best practices (competiti activities, resources, hurd barriers, key success fact	



D2

We have developed a new data request around five key topics of typical hydrogen valley development – Final survey will be online-based with confidentiality options









1. H2V: Clean Hydrogen (JU) in action and its alignment with Climate Policies

2. PDA – Project Development Assistance (I & II)





3. Mission Innovation 2.0 - H2Valley Platform

4. Main take-aways





*Main Take-aways

Top-Down ambition feeding Bottom-Up aspirations

- Clean hydrogen as an energy carrier that can address the decarbonisation of hard-to-abate sectors like the long-haul heavy-duty transportation and industry (as feedstock or high-heat grade fuel)
- ✓ H2Valleys reveal the true potential of H2 as a clean energy carrier. Green H2 as enabler of increased cheap and intermittent RES penetration and Sectoral Integration. Most H2Valleys in the MI Platform will reach commercial maturity by 2025
- ✓ Until 2030, H2Valley concept to boost the market uptake and de-risk projects' deployment, shifting and mitigating risks within its own structure (Special Purpose Vehicle) - e.g. shifting risk from RES to H2 offtake via cPPAs; Support still required until then
- ✓ **Synergies** between funds are key for initial market uptake
- ✓ Takes time and expertise to see projects off the ground PDA, TA
- ✓ Economically attractive at all levels: to Cities&Regions, Countries and Regional blocks





Keep in touch

Pedro GUEDES DE CAMPOS

Financial Engineering Officer pedro.guedes-de-campos@clean-hydrogen.europa.eu

Avenue de la Toison d'Or 56-60 B-1060 Brussels, Belgium

Tel: +32 2 221 81 44 **GSM:** +32 478 53 20 36 WhatsApp: +351 967530150

For further information

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







