Mission Innovation Hydrogen Valley Platform

Virtual Relaunch Event: www.h2v.eu

Brussels, 8 May 2023

Welcome

Mirela Atanasiu

Head of Unit Operations and Communications,
Clean Hydrogen Partnership

H2.0 Valley Platform Relaunch Event

1 Welcome and introduction

10:00 – 10:05: Mirela Atanasiu, Head of Unit Operations and Communications, Clean Hydrogen Partnership

2 Opening remarks

10:05 – 10:15: Rosalinde van der Vlies, Vice-Chair of the Mission Innovation Steering Committee
10:15 – 10:25: Kurt-Christoph von Knobelsdorff, CEO of NOW GmbH, German Sen. Rep. for the Clean Hydrogen Mission

3 Key highlights of global Hydrogen Valley developments and new features of the Hydrogen Valley Platform 2.0 (incl. Q&A)

10:25 – 10:50: Uwe Weichenhain (Senior Partner) and Markus Kaufmann (Principal), Roland Berger
Laura Marquez, EU Research and Innovation Consultant, Inycom

4 Project snapshots and panel discussions: Best practices of Hydrogen Valleys

Moderators: Uwe Weichenhain and Markus Kaufmann, Roland Berger
10:50 – 11:15: Session 1 - Building and managing Hydrogen Valleys
11:15 – 11:40: Session 2 - Project development and funding of Hydrogen Valleys
11:40 – 11:50: Q&A

5 Closing remarks

11:50 – 12:00: Matthijs Soede, Director, Mission Innovation Clean Hydrogen Mission

Ask your questions on slido.com using **#H2ValleyPlatform**

Opening remarks

Rosalinde van der Vlies

Vice-Chair of the Mission Innovation Steering Committee

Opening remarks

Kurt-Christoph von Knobelsdorff

CEO, NOW GmbH and
German Senior Representative for the
MI Clean Hydrogen Mission

Key highlights of the global Hydrogen Valleys development and new features of the Hydrogen Valley Platform 2.0 (incl. Q&A)

Uwe Weichenhain

Senior Partner,
Roland Berger
Global Hydrogen Lead

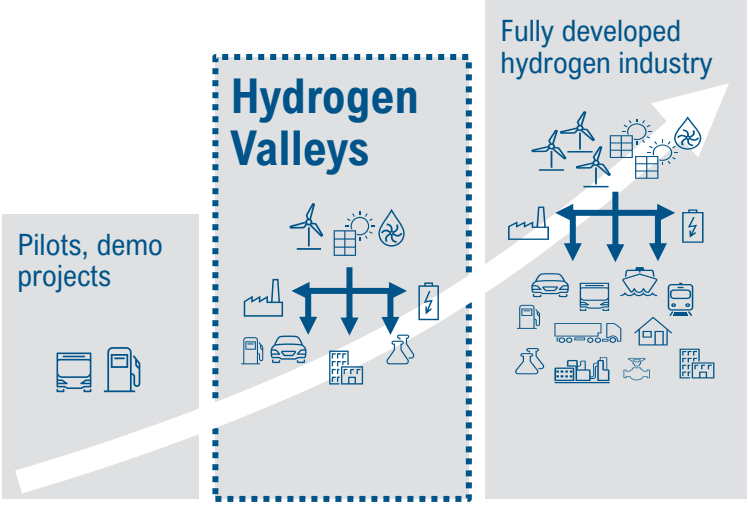
Markus Kaufmann

Principal,
Roland Berger
Global Hydrogen Team

"Hydrogen Valleys" are local market makers for clean hydrogen – Integrated infrastructure projects along the full value chain

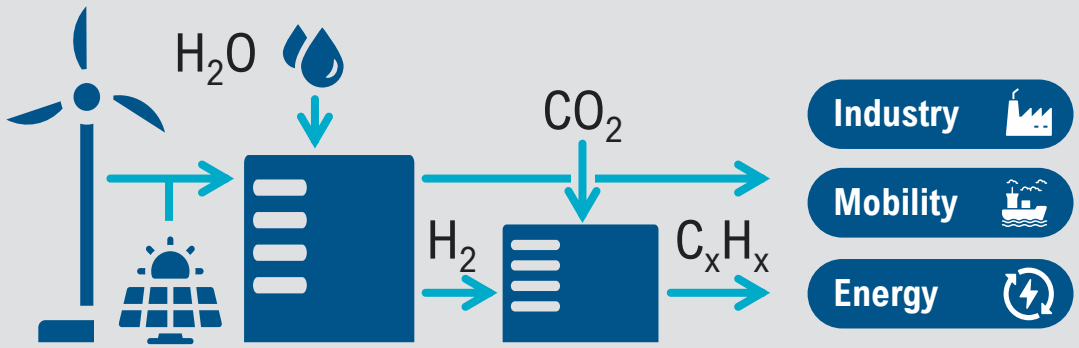
Hydrogen Valleys …

- Next-generation H2 market development
- Integrated (and larger-scale) projects covering more and more of the value chain – "mini hydrogen economies"



… and what they're made of

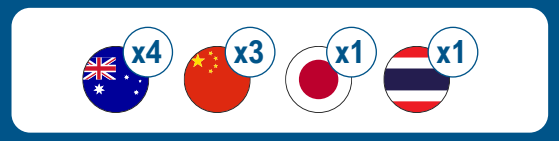
- **Large-scale joint investment** (> EUR 10 m and up to multi-bn EUR)
- **Full hydrogen value chain coverage**
  - Centralized clean hydrogen production (*de facto* mostly green H2)
  - Shared infrastructure (e.g., pipelines, refueling stations)
  - Multiple end-uses (e.g., steel industry, fuel cell trucks)
- **Clear regional scope** (e.g., around a major port)



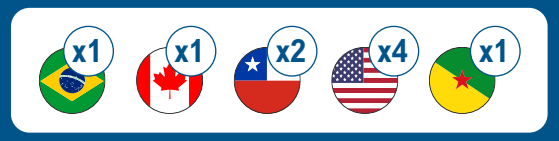
Hydrogen Valleys are truly going global – As of today, we have identified more than 80 Hydrogen Valleys under development around the world

Europe

Asia-Pacific



Americas



Middle East & Africa

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

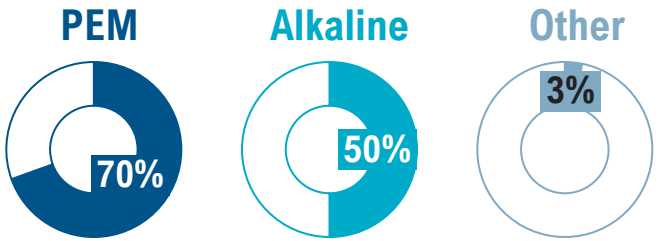
Hydrogen Valleys focus on green H_2 for various end-uses in mobility, industry, and energy sectors

Upstream

~ 8.5 mt

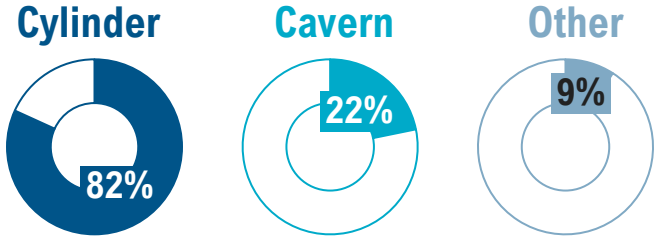
annual green hydrogen production volume[1)]

Electrolyzer technologies

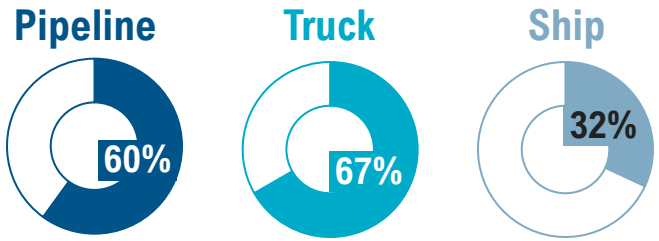


Midstream

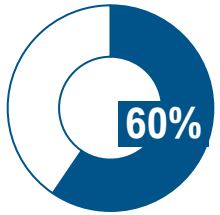
Storage (mainly compr. gas. H_2)



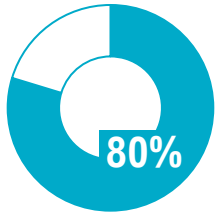
Transportation



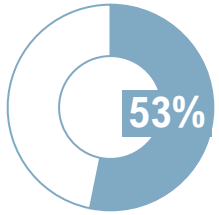
Downstream



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



Mobility end uses (mainly buses, trucks and cars)



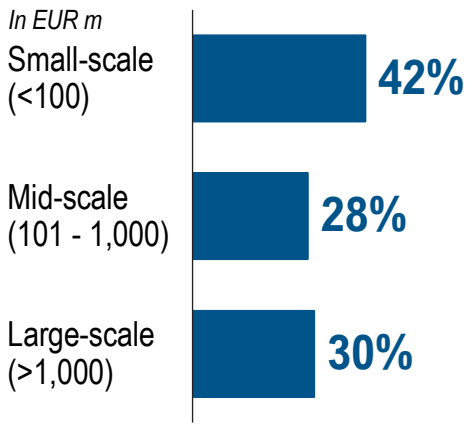
Energy end uses (esp. grid injection and gas-fired power plants)

1) After reaching maximum build-out stage

With EUR 90+ bn planned investment, Hydrogen Valleys are on a path to competitiveness with fossil H_2

Investment

> EUR 90 bn
total investment

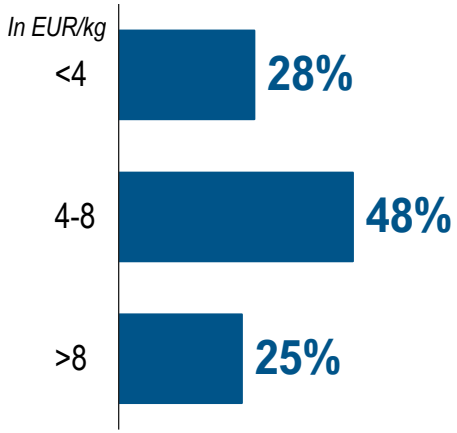


…tend to be mobility focused

…tend to be industry/ energy focused

Hydrogen cost

Ø 6 EUR/kg
hydrogen cost

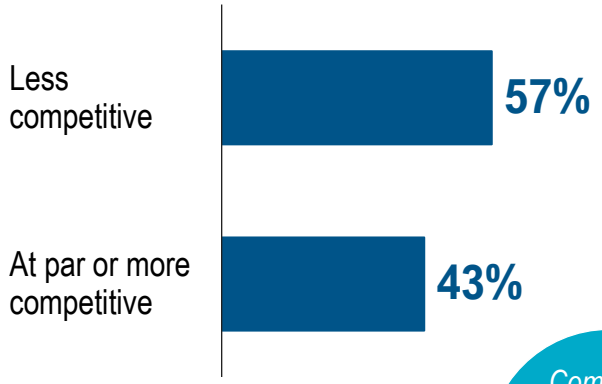


..tend to be larger-scale projects

… tend to be smaller-scale projects

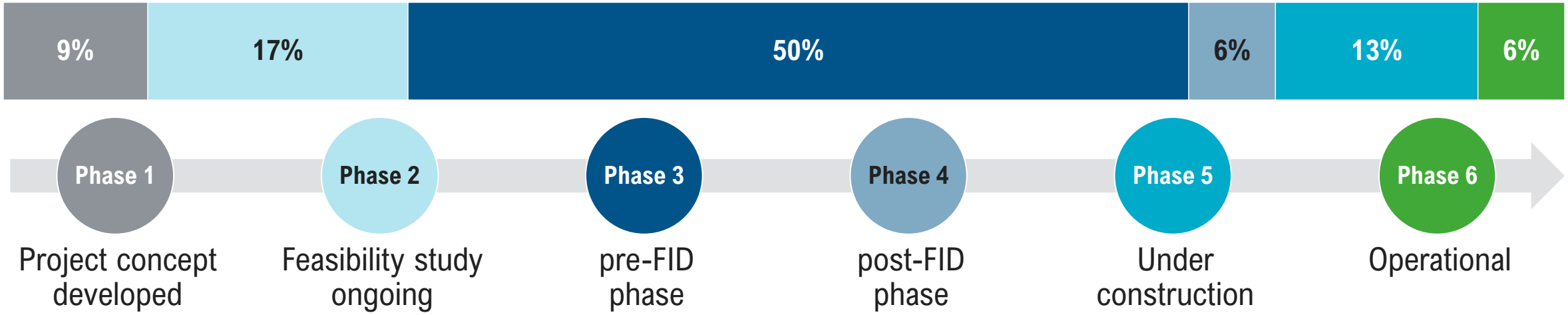
Competitiveness

… growing commercial
confidence

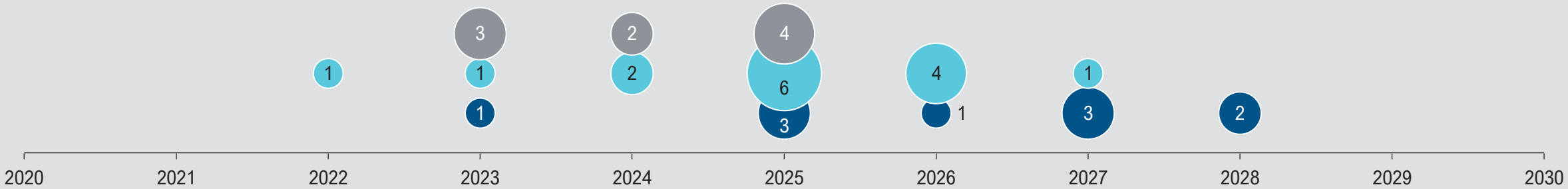


Compared to conventional offering, as per developers' own assessment

Hydrogen Valleys are still "early stage" – About 3/4 of projects under development are yet to reach a final investment decision



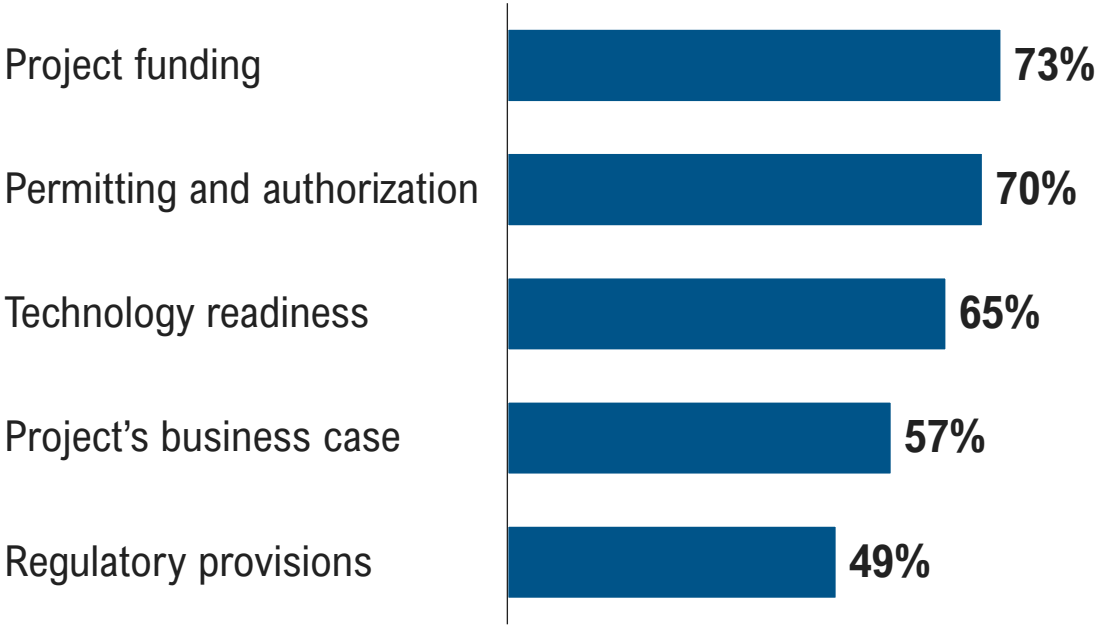
Planned start of operations of European Hydrogen Valleys [# of projects[1)]]



Note: Small scale: Investment < EUR 50 m; Mid scale: Investment EUR 50 – 500 m; Large scale: Investment > EUR 500 m; 1) n = 34

Hydrogen Valley developers face common challenges, especially concerning funding and regulation

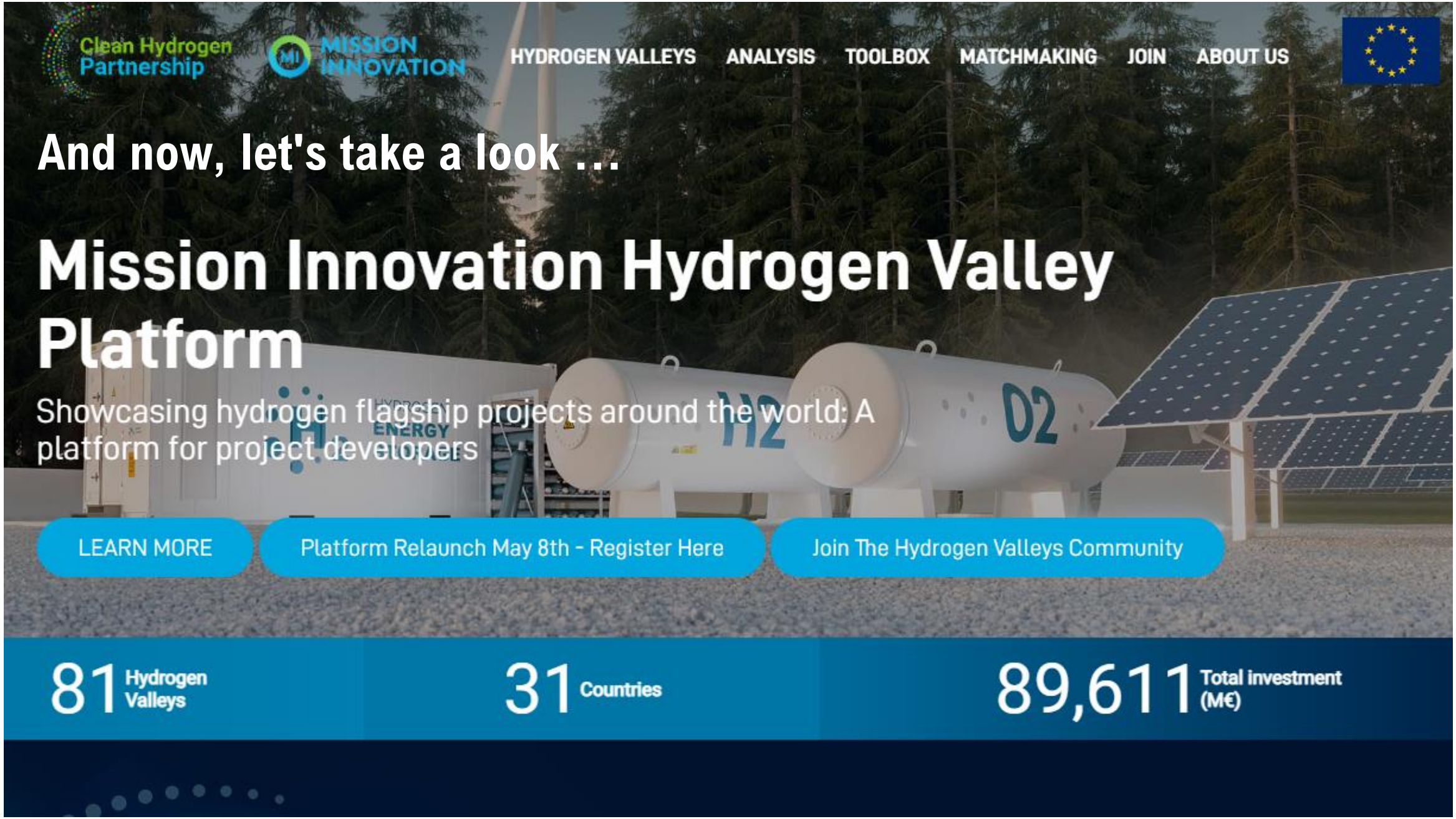
Top overall challenges when developing Hydrogen Valleys[1]



Top overall success factors when developing Hydrogen Valleys[1]

1) Top 5 answers from survey; multiple answers possible

And now, let's take a look …



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HYDROGEN VALLEYS ANALYSIS TOOLBOX MATCHMAKING JOIN

Hydrogen valleys > Heavenn 0

HEAVENN

HEAVENN is a large-scale demo project addressing the requirements of the call, by bringing together core elements: production, distribution, storage and local end-use of hydrogen into a fully-integrated and functioning Hydrogen Valley.

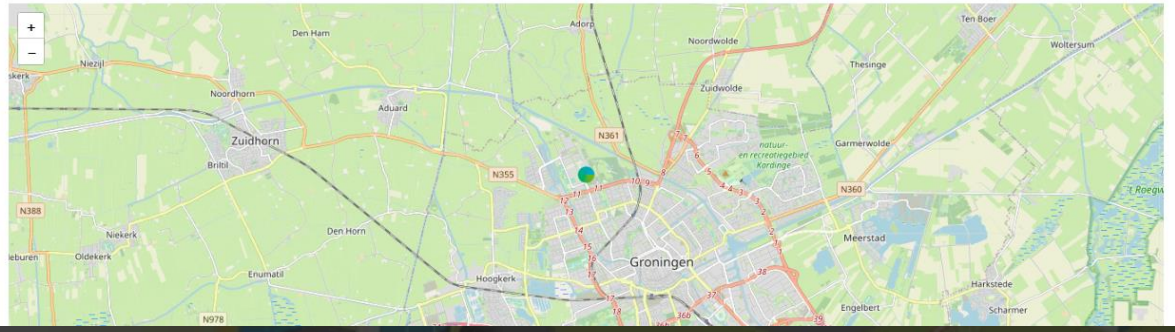
LEAD DEVELOPER
New Energy Coalition

PROJECT PARTNERS
Gasunie, Nobian, Engie, Getec, Groningen Seaports, Nederlandse Aardolie Maatschappij, QBuzz, TotalEnergies, Energie Beheer Nederland, Lenten Scheepvaart BV, Green Planet, Municipalities of Groningen, Hoogeveen and Emmen, HyEnergy TransStore, Shell, H2Tec,

MAIN POLITICAL SPONSORS
Province of Groningen, Province of Drenthe, The Netherlands Ministry of Economic Affairs and Climate, The Netherlands Ministry of Infrastructure and Water Management

MAIN LOCATION
Netherlands

OTHER LOCATIONS
Yes



Project **details**

- **H2 PRODUCTION VOLUME [T/year]:** 36500
- **INVESTMENT VOLUME [M€]:** 2,800.00
- **FUNDING**
  - Public: EU funding
  - Public: National funding
  - Public: Regional funding
  - Public: Local funding
  - Private funding
- **VALUE CHAIN COVERAGE**
  - PRIMARY ENERGY SOURCING
  - **H2 PRODUCTION**
    - Water electrolysis with PEM electrolyser
    - Water electrolysis with ALK electrolyser
    - Byproduct
  - **H2 STORAGE**
    - Cavern - Compressed H2
  - **H2 TRANSPORT**
    - Pipeline - Compressed H2
    - Trucking - Compressed H2
    - Ship - Compressed H2
  - **H2 DISTRIBUTION FOR MOBILITY**
    - HRS 700 bar
    - HRS 350 bar
- **END USES**
  - **MOBILITY**
    - Cars
    - Buses
    - Trucks
    - Ships
    - Other
  - **ENERGY**
    - Stationary fuel cells for distributed generations - Back-up or off-grid applications
    - Hydrogen supply to gas-fired power plants
  - **INDUSTRIAL FEEDSTOCK**
    - Supply to other industries

Project **timeline**

CURRENT STATUS: **post-FID (financing, tendering, etc.)**

- **2014**
- **2019** Start of project development
- **2026** Project finalization
- **2035**

Statistics
- Fundamentals
- Value Chain
- Preparation
- Financing
- Impacts

Barriers

Best Practices

Reports

Statistics

This section is based on the most comprehensive survey that has ever been conducted on Hydrogen Valleys globally. More than 2,500 data points collected from more than 30 Hydrogen Valleys offer an exclusive look inside the projects and provide you with details on the Valleys' fundamentals, technologies deployed, project development, financing aspects as well as overarching project goals and benefits.

Barriers

Also based on the Hydrogen Valley Survey, this section explores the barriers that the Hydrogen Valleys indicated. Both during the preparation and the financing phase, the projects provide an exclusive look into their specific challenges and hurdles they faced or are facing to this day. On top of that, have a look at the most important regulations for successful projects according to the Hydrogen Valleys.

Best Practices

The Best Practice section offers insights into various topics commonly identified as main hurdles and barriers for Hydrogen Valleys, ranging from how to successfully obtain both private and public funding, how to secure off-take commitments, manage technological risk, cooperate with project stakeholders and much more. The Best practices are based on comprehensive interviews with outstanding Hydrogen Valleys that have been managing selected challenges particularly well.

Reports

The final report regarding the Hydrogen Valley Platform can be found here.

Analysis > Statistics > Value chain > Overview

Statistics
- Fundamentals
- Value Chain
  - Overview
  - Primary energy sources
  - Hydrogen production
  - Hydrogen storage/conversion
  - Hydrogen transport
  - Hydrogen distribution for mobility
  - End use applications
- Preparation
- Financing
- Impacts

Barriers

Best Practices

Reports

Overview

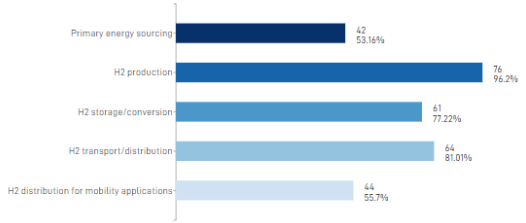
This section provides an overview on the many different parts of the hydrogen value chain covered by Hydrogen Valleys. If you want to find out more about the value chain coverage of specific Hydrogen Valleys, go to our Hydrogen Valleys section where project-specific overviews provide additional insights.

Value chain coverage (number (share) of Valleys)

This question provides insights into the value chain coverage of Hydrogen Valleys displaying both the number of Valleys as well as the share of Valleys. Please note that the Hydrogen Valleys were able to choose multiple answers. Use the filter options to find out information on Hydrogen Valleys based on more specific characteristics.

Filter

None > No filter applied



Statistics
Barriers
Best Practices
Commercial de-risking
Technological de-risking
Coalition building/project governance
Stakeholder management/public support
Industrial policy impact
Private funding
Public funding
Reports

Best practices

In this section, our most advanced Hydrogen Valleys give in-depth insights into their project's previous development and current status. Learn more about the most commonly faced hurdles and the best practices and lessons learned on how to overcome them.

COMMERCIAL DE-RISKING

- ACES
- ZEV
- CEOG
- HEAVENN

TECHNOLOGICAL DE-RISKING

- H2BE
- HEAVENN

COALITION BUILDING/PROJECT GOVERNANCE

- Grande Region Hydrogen
- North Adriatic Hydrogen Valley
- NZKG

STAKEHOLDER MANAGEMENT/PUBLIC SUPPORT

- ACES
- ZEV
- eFarm

INDUSTRIAL POLICY IMPACT

- SoHyCal

PRIVATE FUNDING

- CEOG
- HyWays for Future

PUBLIC FUNDING

- Hydrogen Valley South Tyrol
- HEAVENN
- NZKG

Statistics
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Private funding

What challenges did you face during the processes of obtaining private funding?

CEOG: A general challenge in privately financed projects such as this one is always the financial negotiations with equity and debt partners – especially for new technology projects that aim to be 100% privately funded.

HyWays for Future: As the lead entity on the HyWays for Future project, EWEs main task is the conflation of the willingness to invest of different investors in the Hydrogen Valleys and along the hydrogen value chain. This requires a continuously high degree of communication and coordination with all involved stakeholders and project partners (around 90 in total), especially in the run up of funding applications and funding approvals. The new element or the next "evolutionary step" of the HyWays4Future project is the combination of different value chain elements into one project (e.g. green hydrogen production, refueling stations, fleets of urban buses, FCEVs, etc.) – as it is for many German Hydrogen Valleys co-funded by the Federal Government and German State Governments (HyLand, HyStarter). Typically, each stakeholder individually is quite certain about his own project – the essential challenge is to bring all of them together to bring complexity, scale and commercial model to the next level (for example combining the volumes of hydrogen consumption of multiple mobility operators).

What specific measures did you take to overcome these challenges?

CEOG: We brought an infrastructure fund onboard very early in our overall project timeline; it is especially focused and experienced in energy transition projects. They contributed not only capital, but also project development know-how. We believe that having a strong equity partner on board at the stage during which capital-intensive development costs need to be funded is vital for projects that cannot or do not want to rely on public funding in the development phase.

HyWays for Future: In a nutshell, we considered two things important: Building a large-enough, high-quality partnership and focusing on a business case where clean hydrogen is closest to competitiveness, i.e. mobility. In the early phase of our project, we connected with a large number local and regional players that could become potentially valuable long-term partners – and that also could be part of short-term viable business cases in hydrogen mobility. As a result, we were able to meet our self-set targets of a strong partnership (meeting our minimum requirements for quantity and quality). Furthermore, we ensured that our collaborations initiated a coverage of the whole mobility value chain, keeping in mind that investments into one part of the hydrogen sector will always depend on the development of the other parts, e.g. investments into FCEVs requiring simultaneous investments into hydrogen production, distribution and refueling stations.

What learnings can other projects take away from your experience?

CEOG: The key advice we can give from our experience: private funding institutions are usually not interested in small projects. Thus, don't waste time and money on starting a demonstration project on a small scale with a broad range of applications, but rather focus your project on one specific hydrogen application and scale it up to become interesting for private investors. In the end, it is not about the technology, but about what the funding investor thinks of and expects from your project.

HyWays for Future: The key learning for emerging Hydrogen Valleys is to build a growing network along the value chain very early on and to keep investing into the collaboration of stakeholders. Additionally, we believe that a high degree of "competition" among regional hydrogen players can become counterproductive in an early market phase. Instead, a sense of broad and cooperative thinking should be in focus to help get larger and more integrated projects off the ground. Here, "coordination" itself is a critical asset for a hydrogen valley project.The next step for us now is to connect our Hydrogen Valley with other regions that are already active in the hydrogen sphere. The overall hydrogen market will not scale up further as a mere agglomeration of "islands" – for the market, the value of the Valleys together will be larger than just the sum of all projects. Thus, the overarching goal of the Hydrogen Valley concept should be to ultimately provide links between Valleys and ensure a continuous expansion of activities.

All Hydrogen Valley platform members can now sign-up for the members area here: **https://membersarea.h2v.eu/**

Clean Hydrogen Partnership

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Say something to the Community

+ Add images | Community | Post

Laura Márquez posted
43 minutes ago · Community

Join us for the official re-launch of the Hydrogen Valleys Platform next Monday, May 8th! More info on the events section

1 like

Laura Márquez · 41 minutes ago
Register here: https://bit.ly/3NB3M2i
0 likes

Write a comment... | Comment

Laura Márquez posted
52 minutes ago · Community

Hi community!

0 likes

Write a comment... | Comment

My upcoming events

Re-launch of the Hydrogen Valleys Platform
8 May '23 10:00 - 12:00 (CEST)
You have enrolled

All my upcoming events

Upcoming events
in the community

Re-launch of the Hydrogen Valleys Platform
8 May '23 10:00 - 12:00 (CEST)
You have enrolled

Hydrogen for Clean Transport Conference 2023
10 May '23 10:10 - 16:30 (CEST)

All Upcoming events

Newest members
in the community

Laura Márquez
EU Reserach and Innovation Consultant @ Inycom

All members

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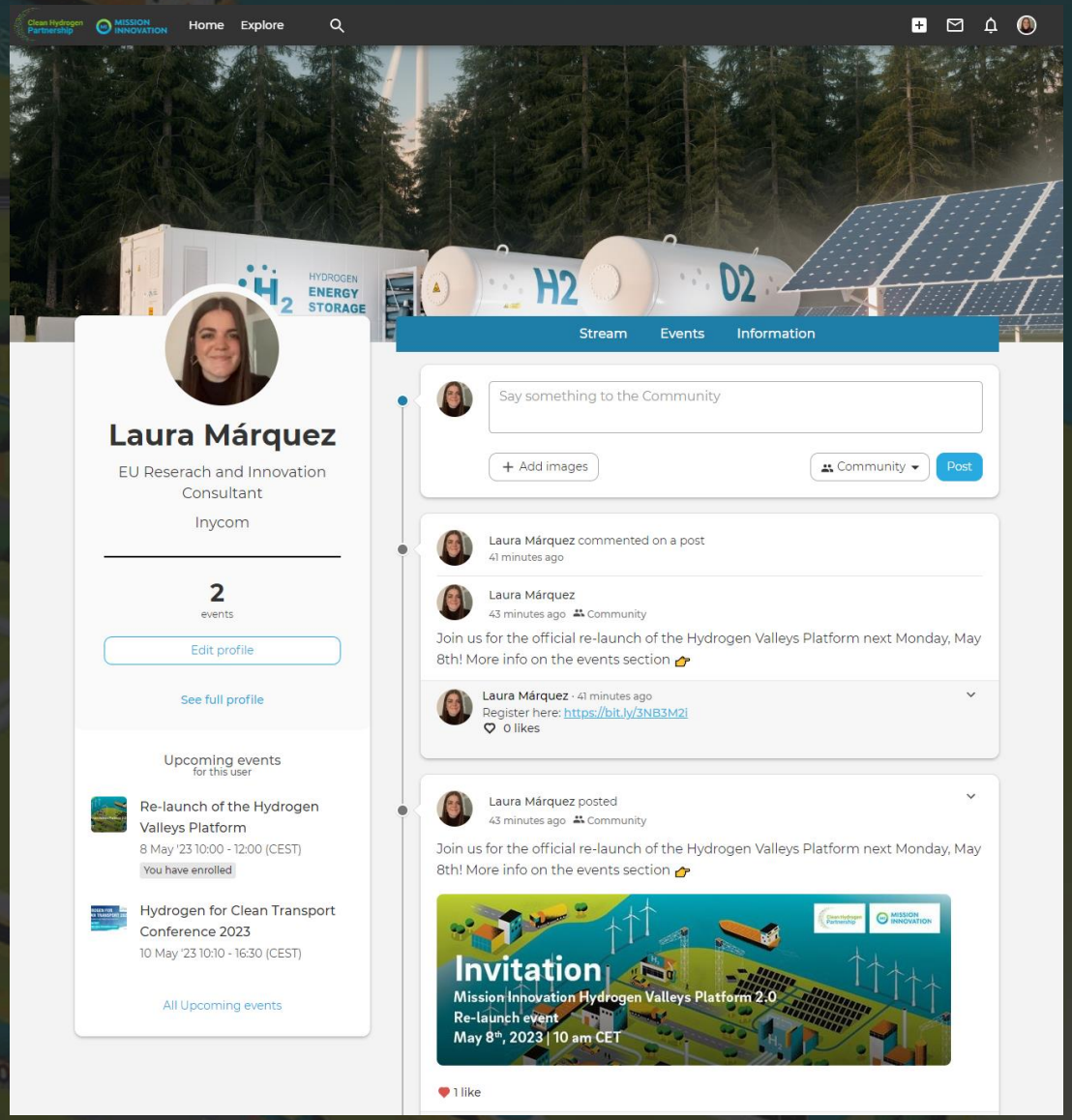


Do you represent a Hydrogen Valley? Join us now!

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

HYDROGEN VALLEY • CERTIFIED BY MISSION INNOVATION • H2V

What's next for the Hydrogen Valleys platform? Our way forward

Reports and analytics

- **Update reports** on the state-of-play of the Hydrogen Valleys
- Continuous **updates of the data analysis section**

Hydrogen Valleys white paper(s)

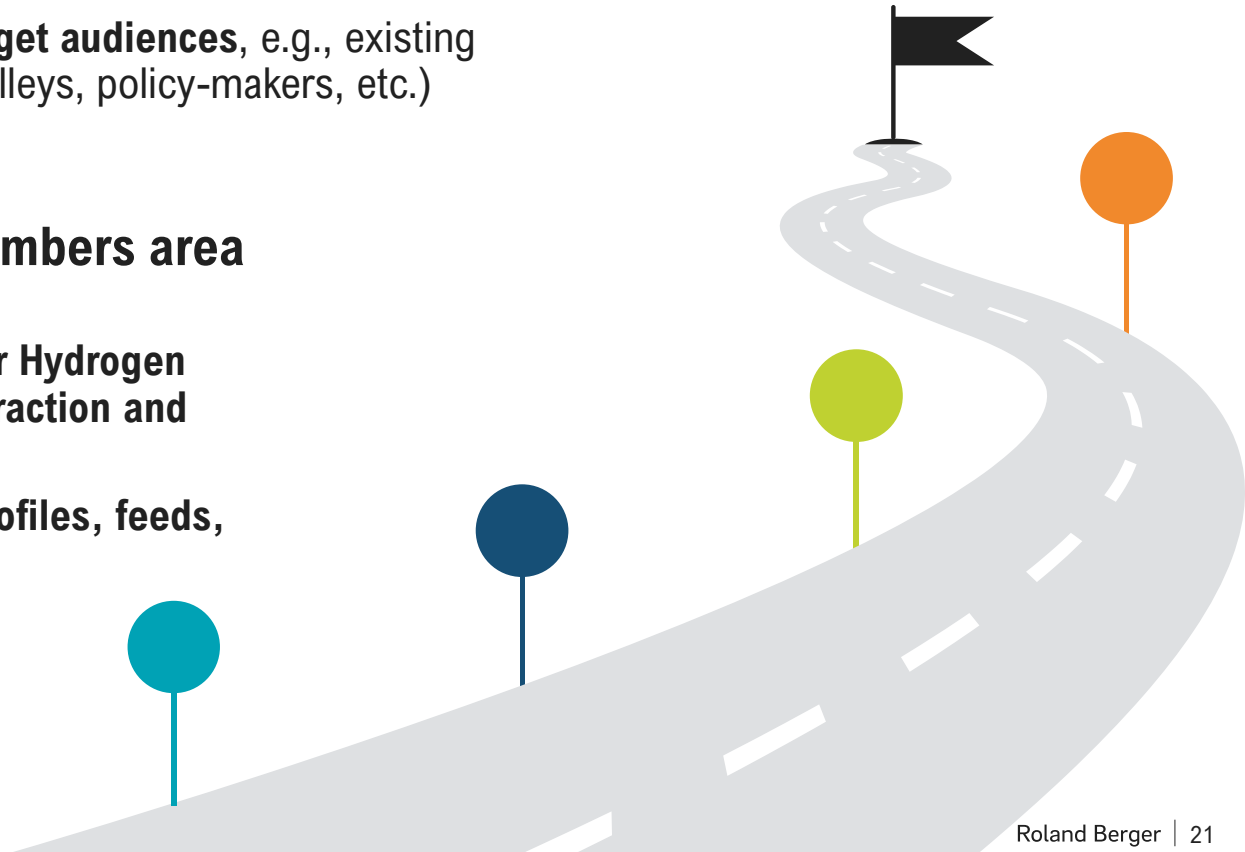
- **Information dossiers** on key insights for successful project development
- Directed at **different target audiences**, e.g., existing Valleys, aspiring new Valleys, policy-makers, etc.)

Topical & regional workshops

- **Workshops** on key **hurdles and success factors** of Hydrogen Valley project development
- Different target **audiences and geographies**

H2 Valleys members area

- A **network dedicated for Hydrogen Valleys** to enhance **interaction and collaboration**
- Creation of individual **profiles, feeds, and events**



Have a look at www.h2v.eu and don't hesitate to reach out

Your contacts at the Clean Hydrogen Partnership

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Markus Kaufmann

Principal

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hydrogenvalleys@rolandberger.com

Moderated panel session 1: Building and managing Hydrogen Valleys

Uwe Weichenhain

Moderation

Senior Partner, Roland Berger
Global Hydrogen Lead

Grande Region Hydrogen,
GER, FRA, LUX

Anamaria Zianveni

Project Manager, Encevo

Clean Hydrogen Coastline,
GER

Geert Tjarks

Head of Business Development, EWE

H2 Valley Mid-Norway
NOR

Nils Rokke

Executive Vice President Sustainability, Sintef

North Adriatic Hydrogen Valley,
SLO/CRO/ITA

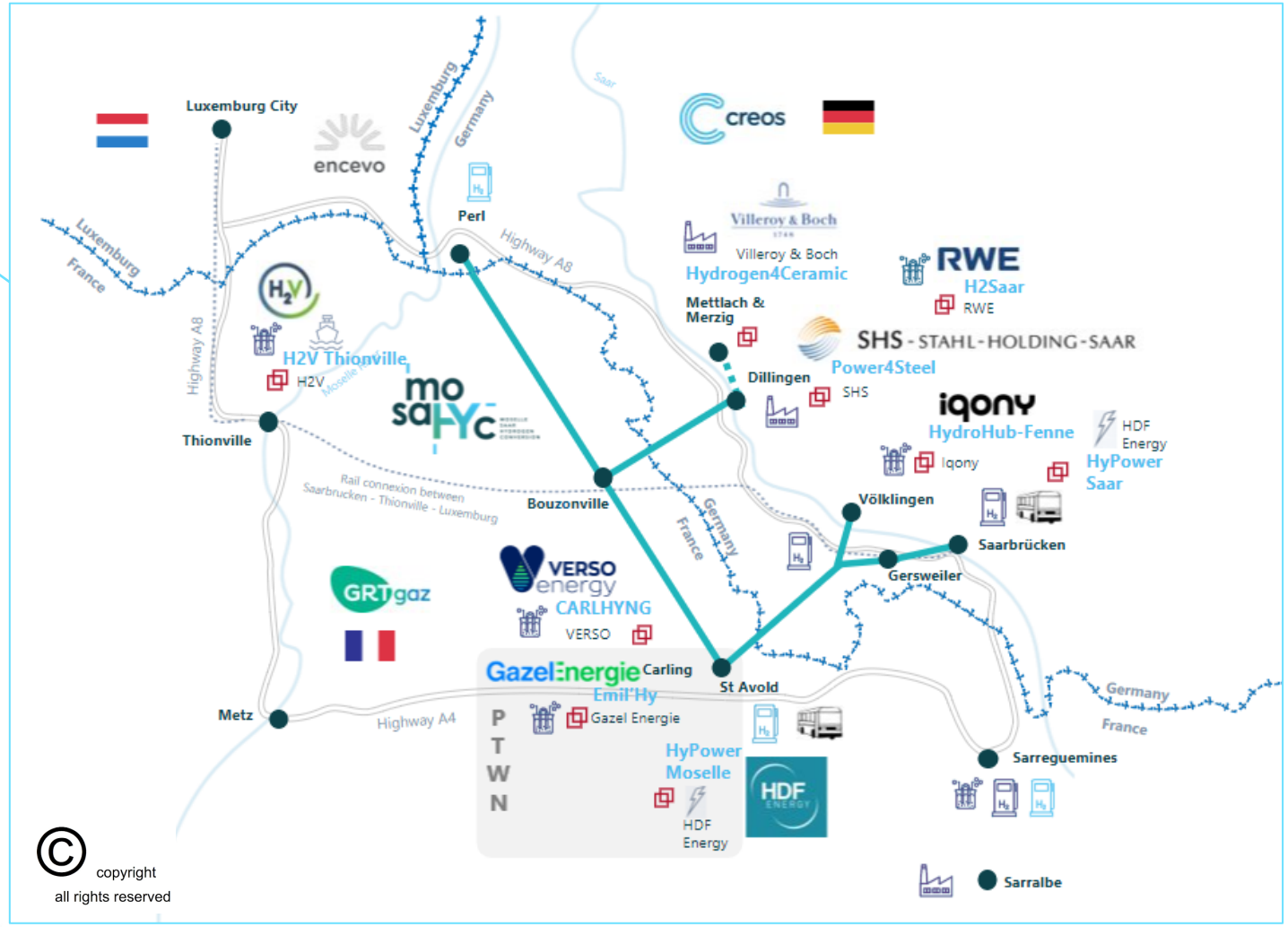
Stephen Taylor

Director / Technical Advisor, Area Science Park

Grande Region Hydrogen: a crossborder H2 ecosystem

Objective: to promote a hydrogen economy along the entire value chain

Common objective for **projects commissioning** in **2027**



H_2 station
Potential H_2 station
Power-to-Gas unit
Industrial consuming H_2
H_2 to power
Key Partner

Grande Region Hydrogen
Unsere Energie. Notre futur.

11 Members
along the value chain

A crossborder H2 **pipeline** grid enabling investments in H2 **production via electrolysis**, **industrial consumption** (e.g. DRI for steel production), **mobility** services

2027-2030, ramp up to **450 MWe of production capacity**

Repurposed & new pipeline: **55 000t** of transported H2/y

Integrated into **hydrogen european development plan**

3 200 000 t/y
of CO2 avoided by 2030

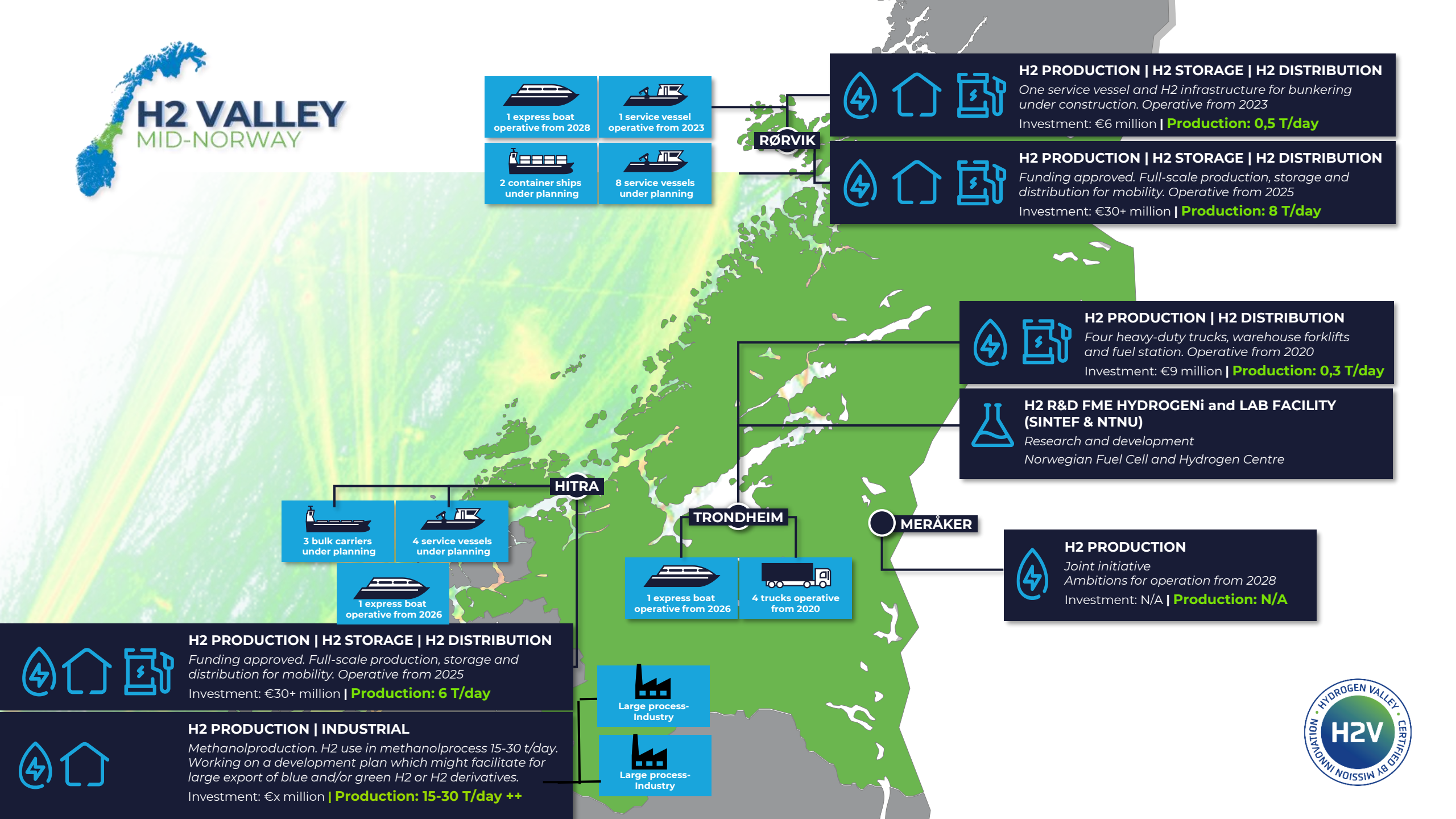
Project Clean Hydrogen Coastline

Integrated approach for a European hydrogen economy

Image: EWE AG

- Create a hub, that will secure **hydrogen production capacities** for an Intra-European energy market with an electrolyser capacity of up to 400 MW by 2026
- Development of a **trans-european hydrogen infrastructure** for transport via pipelines and storage in salt caverns
- Enable **first markets for green hydrogen** in industry and in the transport sector
- Total investment in the technology of around **700 Million €** by the end of 2026
- Suitable **funding scheme and regulatory framework** is required (IPCEI status applied)

H2 VALLEY
MID-NORWAY



North Adriatic Hydrogen Valley (NAHV) the first transnational Hydrogen Valley

- In the beginning there was a bottom-up process led by a visionary industrialist, Aleksander Gerbec
- Letter of Intent – first political declaration of the will to form the first transnational Hydrogen Valley
  - Republic of Croatia/Republic of Slovenia/ Region of Friuli Venezia Giulia, Italy
- Joint Working Group – initial organizational structure defined
  - Institutional partners + representatives of industry and research communities from each of the three territories
- Horizon Europe Call – first funding opportunity identified
  - Large Scale Hydrogen Valley – up to € 25M
- Open calls for manifestations of interest in three territories
  - Over a hundred companies manifested interest
- Rapid but rigorous selection process
  - Assessment of each pilot project proposal for feasibility, readiness and fit
- Construction of partnership and presentation of first project led by Slovenian energy company HSE
  - Consortium constructed to include adequate production/storage/distribution and end use in power, transport and hard to abate sectors
- Ongoing further development of the North Adriatic Hydrogen Valley initiative
  - Extension of activities in the three territories and networking with other hydrogen valleys
- AISBL chosen as future governance model to guarantee success of the transnational model

Moderated panel session 2: Project development and funding of Hydrogen Valleys

Markus Kaufmann

Moderation

Principal, Roland Berger
Global Hydrogen Team

Green Hysland,
ESP

Carlos Navas

Head of Strategy and Regulatory Affairs, Enagas Renovable

H2U Hydrogen Valley,
UKR

Iaroslav Kryl

CEO, Hydrogen Ukraine

SoHyCal,

USA

Pedro Pajares de Tena

CEO, H2B2

Ceará – Green Hydrogen House,
BRA

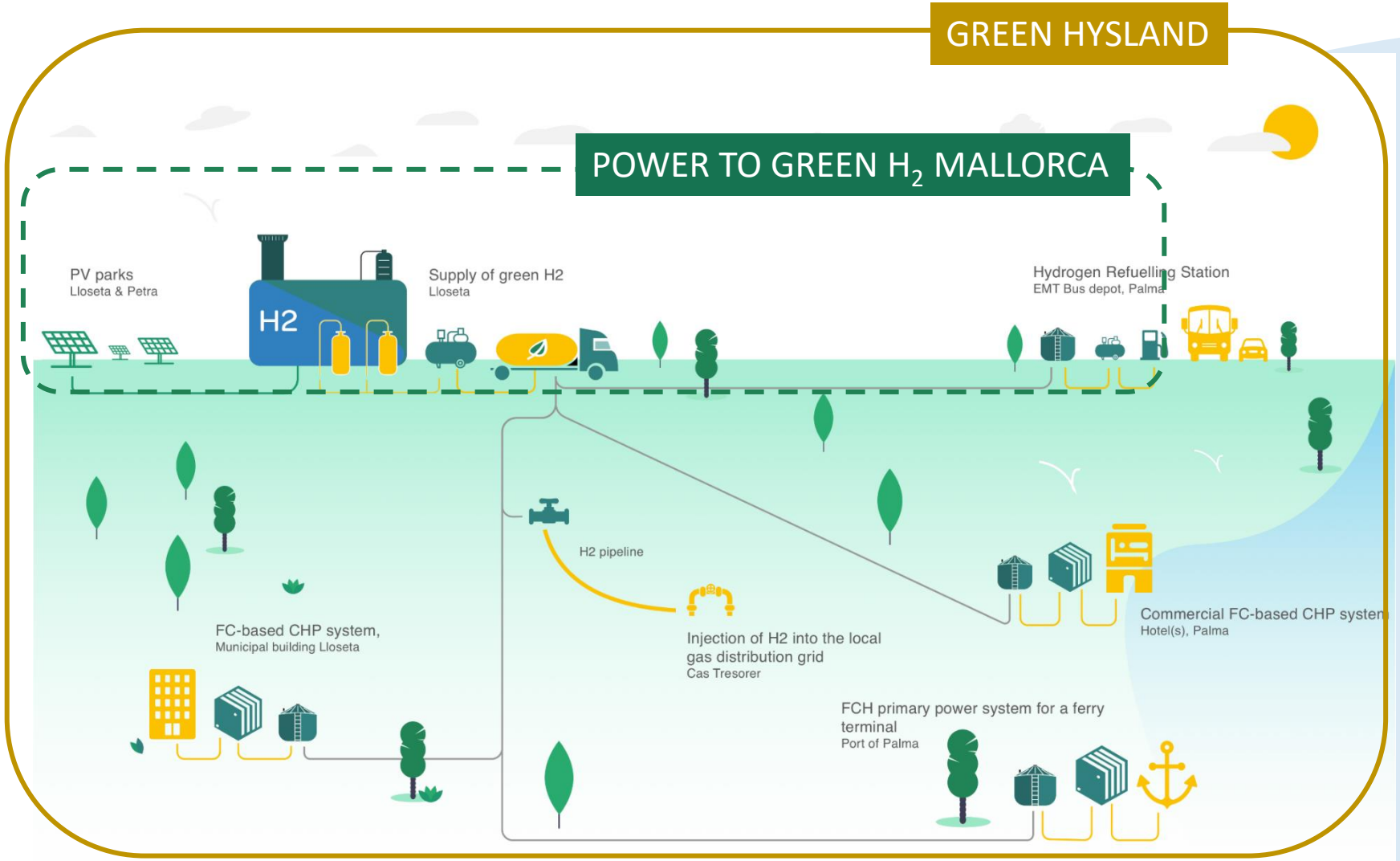
Corne Hulst

COO, Pecem Industrial & Port Complex

GREEN HYSLAND

enagas renovable

GREEN HYSLAND: Deployment of a Hydrogen Ecosystem in the island of Mallorca



Clean Hydrogen Partnership
Co-funded by the European Union

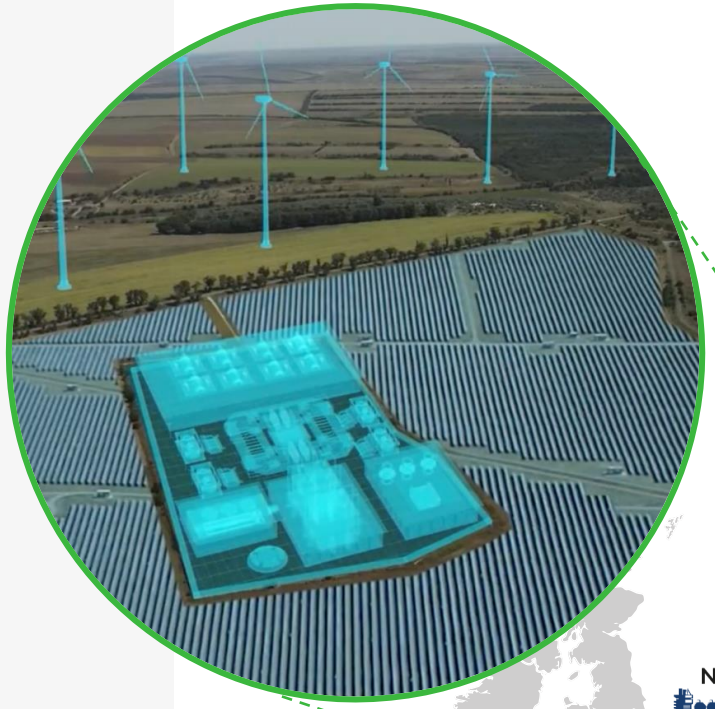
This project has received funding from the Fuel Cells and Hydrogen 2 Joint Undertaking (now Clean Hydrogen Partnership) under Grant Agreement No 101007201. This Joint Undertaking receives support from the European Union's Horizon 2020 Research and Innovation programme, Hydrogen Europe and Hydrogen Europe Research.

H2U Hydrogen Valley in Odesa Region, Ukraine

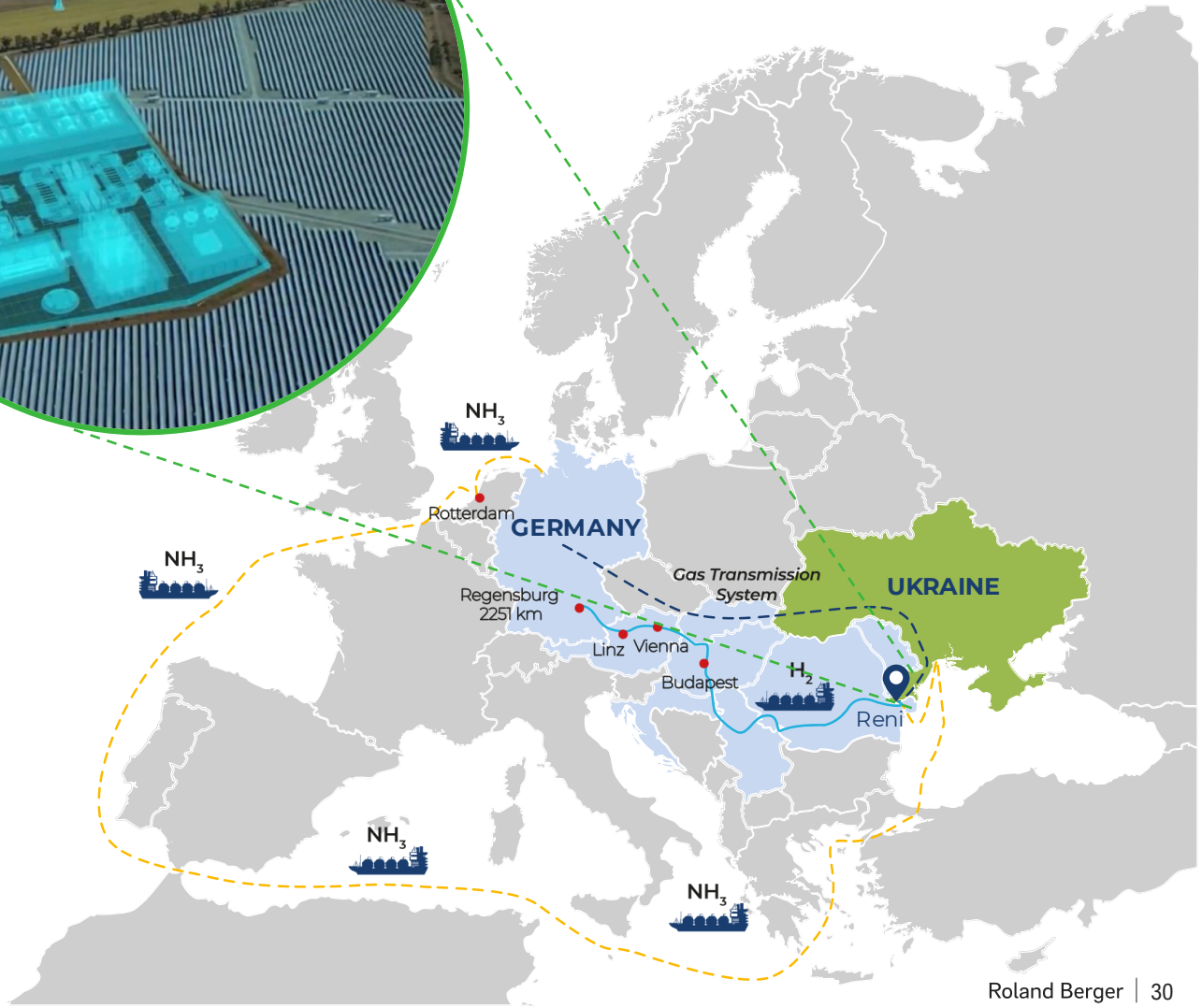
Electrolyser capacity: 100MW
Solar: 120MW
Wind: 80MW

Period of construction: 24 months

HYDROGEN UKRAINE, LLC
20, Lavrska Street,
Kyiv, 1015, Ukraine



Project name	H2U Hydrogen Valley
Lead developer	Hydrogen Ukraine LLC
Location	Reni, Odesa region, Ukraine
Description	Constructing a renewable hydrogen plant aiming for an initial electrolysis capacity of 100 MW, dedicated to producing renewable electricity and green hydrogen for export to EU countries.
Advantages	Abundant water resources, optimal PV and wind power configuration H2 production is strategically located near the EU border
Challenges	Despite challenges due to the Russian invasion, H2U continues to advance the project and contribute to Ukraine's hydrogen energy strategy



SoHyCal Project

Providing the market global solutions

- H2B2 will start producing green hydrogen for mobility in our facility SoHyCal, located in CA Central Valley. Production will ramp up from 1.2 Tons per day by end of 2023 to 3.8 Tons per day by end of S1 2024.

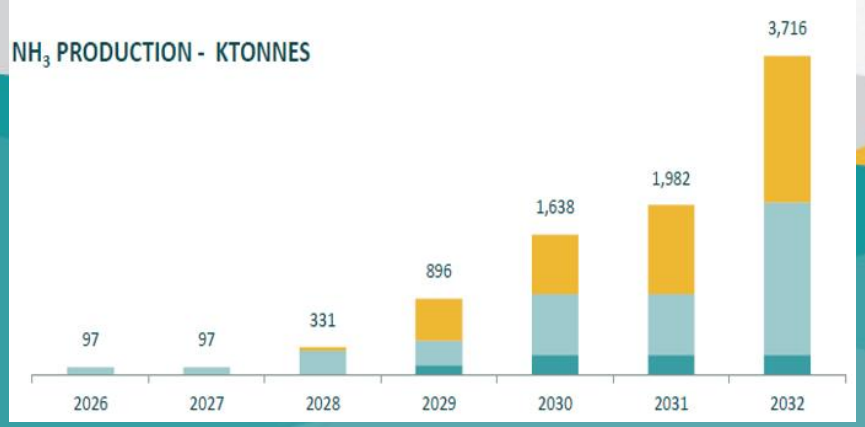
- SoHyCal will start operations by June 2023 with a limited capacity of 300 kg/day.

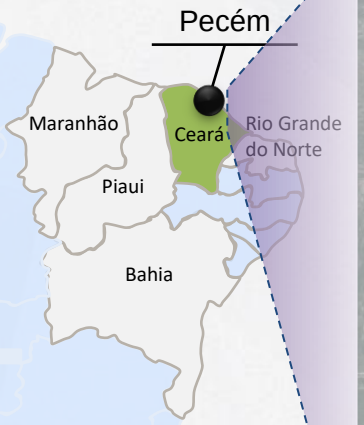
- SoHyCal is a pioneering project, being the first of its kind to be powered behind the meter, 100% renewable energy powered facility by means of biogas and solar energy.

- Hydrogen will be generated and injected into tube trailers for storage and transportation in gas state at up to 520 bars.

Unique Gh2 potential

- **Abundant potential of low cost Renewable Energy**; High full load hrs.
  - Solar; 28,500 GWp
  - Onshore Wind; 880 GW
  - Offshore Wind; 1,335 GW
- **Production water**; Abundant effluent water vs. desalination
- **High demand**; Export to EU & Local GH2 hub
  - Rotterdam 4 Mil. Ton – 2030 / 20 Mil. Ton 2050
    - *Distance to EU & Low transport cost vs. total cost*
  - Pecém Industry; Steel, Power Plants, Cement, Fertiliser
- **Stable investment climate**; Government, Education, Labour market, PoR
- **Commercial**; 20+ MOU's & 3 FEED studies – FID end 2023/begin 2024





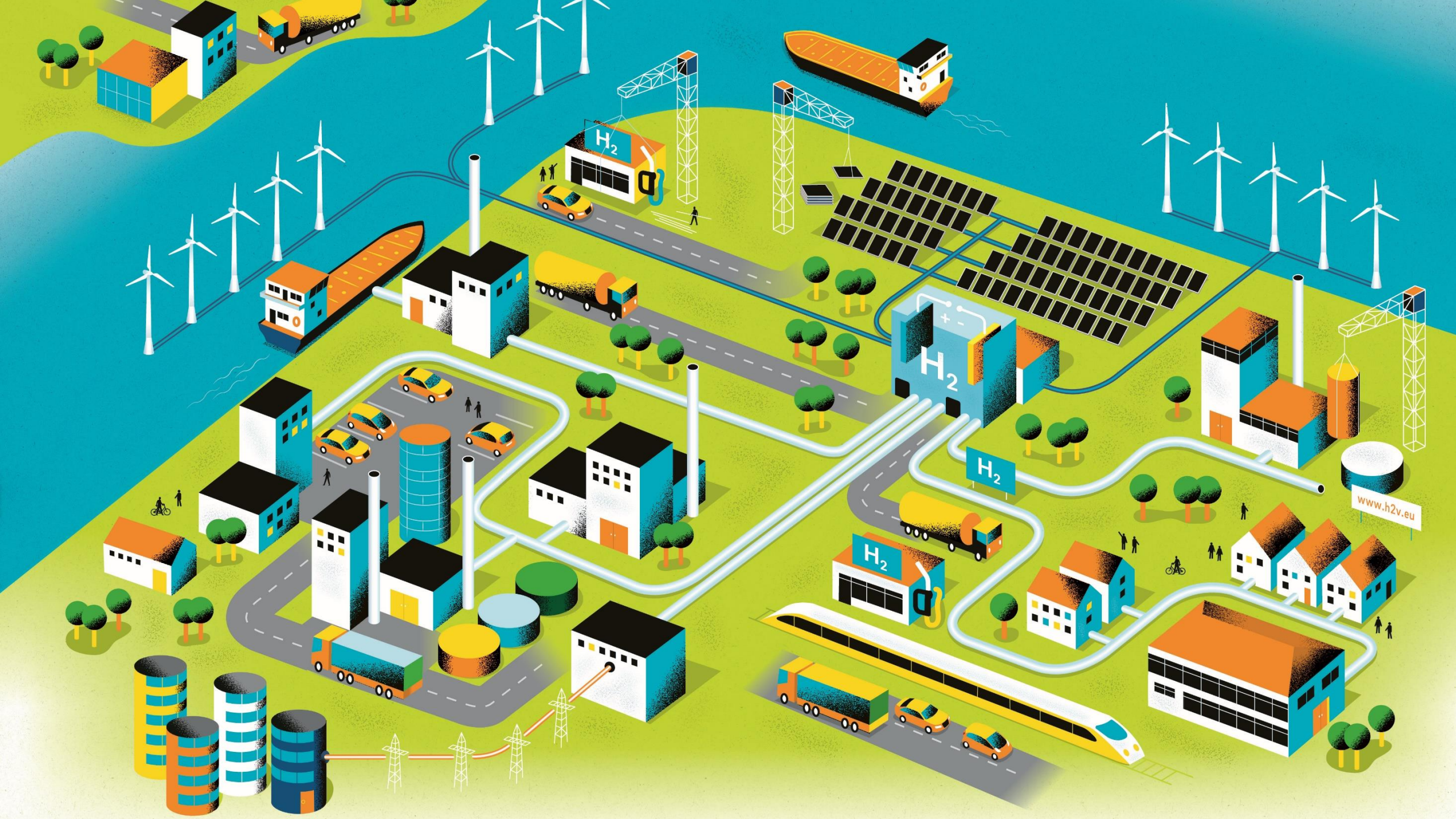
State of Ceará

Pecém hinterland

Closing remarks

Matthijs Soede

Director,
Mission Innovation
Clean Hydrogen Mission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