



ORLEN



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AMBER Hydrogen Valley - Developing a Hydrogen Economy in the Pomerania Region, Poland

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Agenda

- 1. Experience in the area of Hydrogen Projects in Poland**
2. Amber Hydrogen Valley
3. Lessons learned in the Valleys Projects

ORLEN EXAMPLES OF Hydrogen ACTIVITIES

BUSSINES-REGULATORY TRANSLATION TEAM

We have created a special department with competences at the intersection of technology and regulation. This team is able to analyze the impact of regulations on business, as well as propose case studies to improve business models.



RENEWABLE HYDROGEN FUEL PRODUCTION ASSETS

We finalized investment into production assets of renewable hydrogen automotive quality in Poland. We calculated and confirm by external auditor the emission of Hydrogen with reference of EU Taxonomy (GHG emission < 3kgCO₂/kgH₂ in whole value chain.



H2 POWERED SHUNTING LOCOMOTIVE

Together with Polish manufacturer PESA Bydgoszcz we realized first in Europe hydrogen powered shunting locomotive. In September 2023 we realized a test run of a hydrogen-powered locomotive on the iconic Gdynia- Hel route, known for its picturesque and non-electrified railway route.



HYDROGEN ACADEMY FOR STUDENTS

Together with business partners like Toyota, Solaris, PESA we launched the program of exchange knowledge between experienced experts and people interested in the hydrogen and planning to work in the hydrogen industry. The Academy includes a series of lectures/workshops/meetings with site visits of new hydrogen technologies.



New Hydrogen Refuelling Stations launched in 2023

We launched the first 2 publicly available hydrogen refueling stations in the Czech Republic (Prague and Litvinov)



HRS PRAGA

Public open from: 03-2023



HRS LITVINOV

Public open from: 07-2023

Hydrogen Refuelling Station in Poznań

- Hydrogen for cars (H70), trucks and buses (H350)
- HRS can provide fuel for 34 city buses within 12 hours,
- The total capacity of the station is 2,050 kg of H₂,
- Dispensers: 2x 350 and 1x700 bar,
- 3 x discharge panels for H₂ trailers,
- 3 independent compressors



New Hydrogen Laboratory

Hydrogen laboratory launched in Trzebinia by the ORLEN Laboratorium, equipped with research and measurement equipment enabling hydrogen quality tests to be carried out in accordance with the ISO 14687 Grade D standard.



As the only laboratory in Poland and one of the few in Europe, it is able to test the quality of hydrogen in terms of the one ppb level of contamination

Hydrogen-powered locomotive

ORLEN signed agreement for buying the Hydrogen-powered locomotive from the Polish manufacturer PESA Bydgoszcz. In September 2023 we realized a test run of a hydrogen-powered locomotive on the iconic Gdynia- Hel route, known for its picturesque and non-electrified railway route. This is the next step in the process of hydrogen fuel implementation of such railway routes.



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Hydrogen valleys worldwide and in POLAND



> 89
Valleys



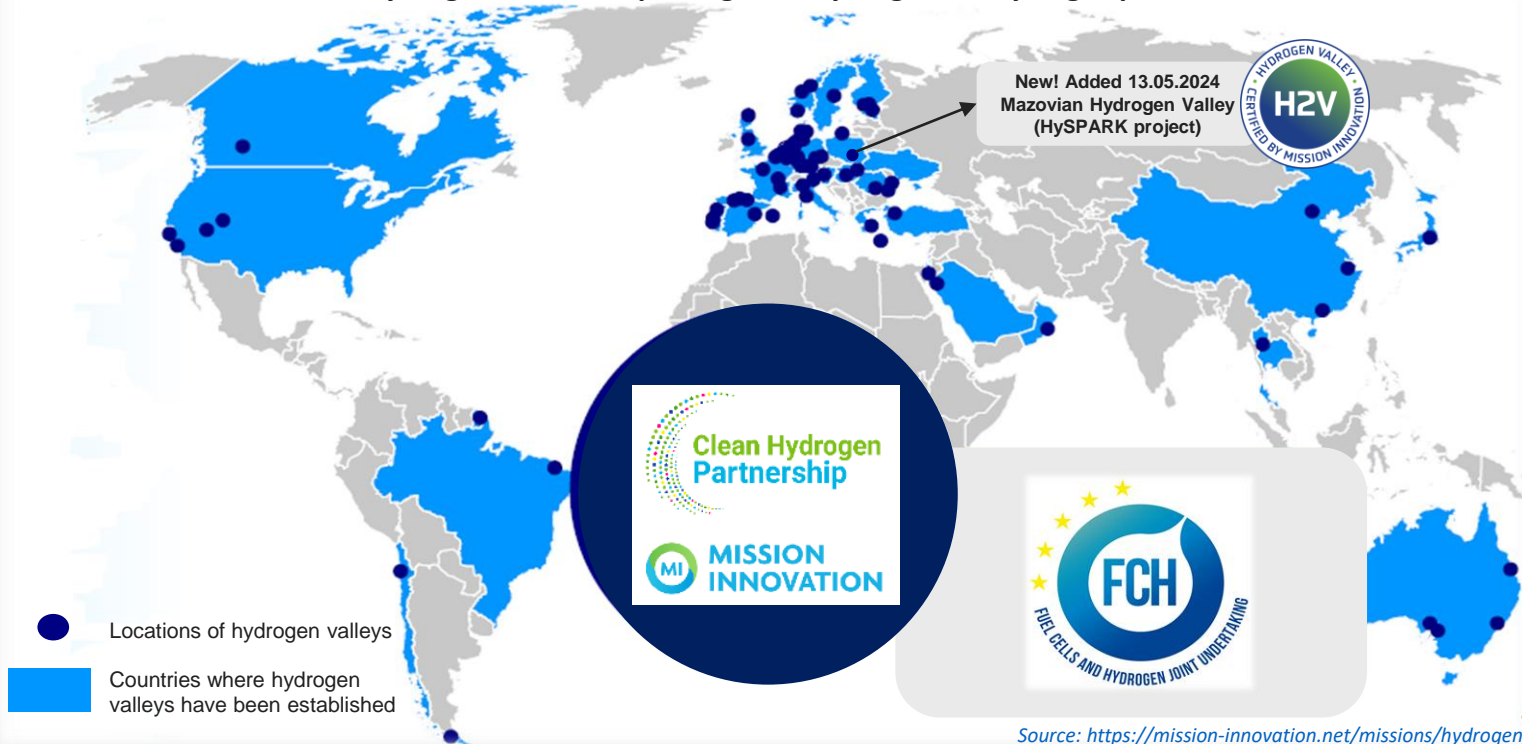
36
Countries



> 173,463
Investment value (M€)



Amber and Mazovian Hydrogen Valley (HySPARK project) has been officially recognised and certified by Mission Innovation and the Clean Hydrogen Partnership as a global Hydrogen Valley flagship.



Source: <https://mission-innovation.net/missions/hydrogen/>

Mission Innovation - Hydrogen Valleys Platform

- Mission Innovation is a dedicated platform promoting hydrogen projects (valleys) worldwide.
- It includes key information about developed projects - hydrogen valleys (e.g., location, executor, investment size, H2 production volume, project status)
- Mission Innovation provides:
 - Marketing and PR activities,
 - Matchmaking with other hydrogen valleys
- All valleys visible on the platform have been validated and received certification

Currently, on the Mission Innovation map, there are two hydrogen valley projects in Poland:

Amber Hydrogen Valley  

and

Mazovian Hydrogen Valley (HySPARK Project)  

The concept of hydrogen valleys is currently one of the main priorities of the European Commission to scale up hydrogen deployment and create interconnected hydrogen ecosystem networks.

North of Poland H2 Ecosystem



Hydrogen production

**Hydrogen HUB
Offshore/Onshore
RES**

H2 Storage

Electrolyzers + cavern,
hydrogen distribution



Hydrogen consumption

Seaports

Gdynia, Gdańsk

- Utilization of H2 for powering port infrastructure



Road transport

Tri-city

- Utilization of H2 in transportation H2 buses, cars and trucks,



Industry

Gdańsk Refinery

- Utilization of H2 in refineries



Rail cargo

Gdańsk

- Utilization of H2 in railway sector (mainly cargo)



1st phase (2024-2027)

- First H2 production HUBs & HRSEs
- >4kta RFNBO H2 production
- Hydrogen introduction to ports and cities**

2nd phase (2030)

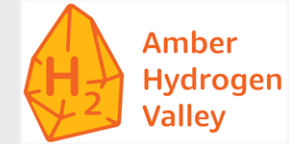
- Large-scale H2 HUBs in operation
- >30 kta RFNBO H2 production
- Hydrogen to Refinery by pipeline**

3rd phase (2035)

- H2 Production scale-up
- >100 kta RFNBO H2 production
- H2 Salt Caverns Storage**

Partners involved

Geographical distribution



Poland (16)

- ORLEN (PL)
- Arthurbus (PL)
- Port of Gdynia (PL)
- City of Gdynia (PL)
- Ekocel (PL)
- Gdańsk University of Technology (PL)
- IMP PAN (PL)
- Baltic Container Terminal (PL)
- GCT (PL)
- OT PORT GDYNIA (PL)
- HES Gdynia (PL)
- Baltic Bub Container Terminal (PL)
- Gdynia Maritime University (PL)
- Wienerberger Ceramika Budowlana (PL)
- 2 other cities in the region

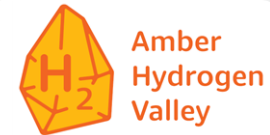


Other EU Countries (7)

- RINA Consulting (IT)
- RINA CSM (IT)
- ATENA (IT)
- Duferco (IT)
- Sinloc (IT)
- ELOGEN (FR)
- PRF (PT)
- MagellanCircle (PT)
- Free Port of RIGA (LV)
- Cursor Oy (FI)
- VTT (FI)
- Proeuropean (DE)
- Hyster-Yale (NL)
- Sticking New Energy Coalition (NL)

AH2V

Consortium



Hydrogen Valley Coordinators



D&C, social assessment and financial schemes

Public partners and local authorities



Research & Education partners

H2 equipment suppliers



H2 users

H2 producer



H2 users

International partners for replication activities



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Lessons learned in the Valleys Projects



Project coordination is a key

- Hydrogen valleys, due to the **scale of the undertaking and the number of partners involved**, remain a **highly complex** organizational issue.
- Therefore, it is extremely important to **assign the role of coordinator to entities with the appropriate experience and practice**.
- For this reason, in HySPark & AH2V, **the coordination role is divided between industry leader (ORLEN) and supporting partner (R&D institute)**.



Collaboration among multiple actors

- Hydrogen valleys are **expected to involve a wide range of partners from business, science, and local governments** to address many challenges in different areas (new technological solutions, business models, regulations, social acceptance, etc.). This results in **many entities participating in the project**.
- As a result, **the number of partners involved in the valleys' Projects implementation should be adequate to the scope of the project**.

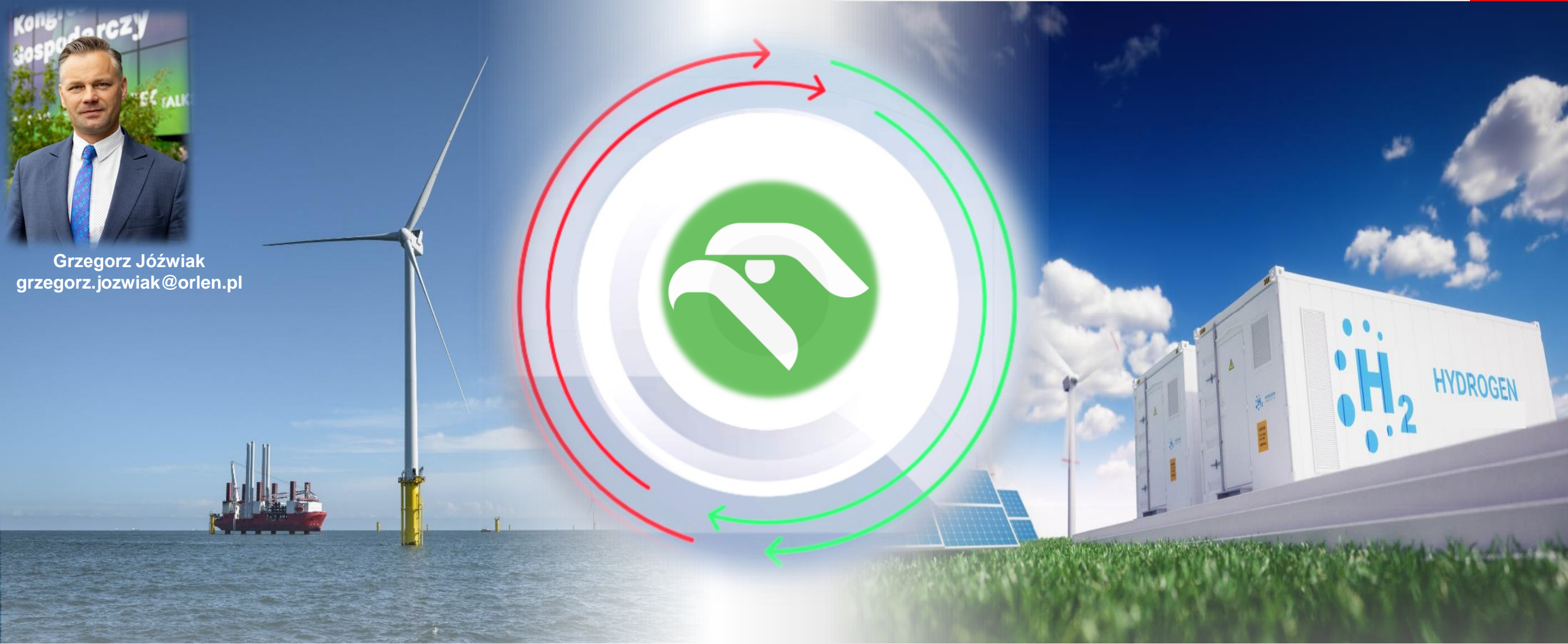


Broad dissemination of project outcomes

- **The outcomes of hydrogen valleys (knowledge, experience) should be widely shared with other projects** that can benefit from them and shorten their path to the **hydrogenization of EU economies**.
- Consequently, it is important to **engage entities** in the hydrogen valley project that can **benefit from the knowledge** generated in the project and **replicate the solutions** developed in the valley in **other locations**.
- **Number of foreign partners responsible for replicating projects has very important role**.



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Thank you for your attention.