# Towards the development of a hydrogen valley demonstrating applications in an integrated ecosystem in Greece

A Small-scale Hydrogen Valley as enabler of a larger Hydrogen Economy | Corinthia, Peloponnese Region, Greece, TRIERES Hydrogen Valley

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The project is supported by the Clean Hydrogen Partnership and its members Hydrogen Europe and Hydrogen Europe Research under Grant Agreement No. 101112056

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# Motor Oil Group in Numbers

| | | |
|---|---|---|
| **€ 13bn**<br>**turnover**<br>(2023) | **€ 854m**<br>**adj. EBITDA**<br>(last 5yr avg.) | **~3,100**<br>**employees** |
| **sales to**<br>**>70 countries** | **1 oil refinery**<br>1/3 of Greece's refining capacity | **1 lubricants' plant**<br>Europe's largest & most advanced regeneration plant |
| **1,500+**<br>**service stations**<br>in Greece and abroad | **839MW**<br>**RES oper. capacity** | **~€ 3bn**<br>**investments in 2014-23** |
| **history of**<br>**50+ years** | **listed on the ASE**<br>**since 2001** | **€ 3.1bn**<br>**market cap.** |

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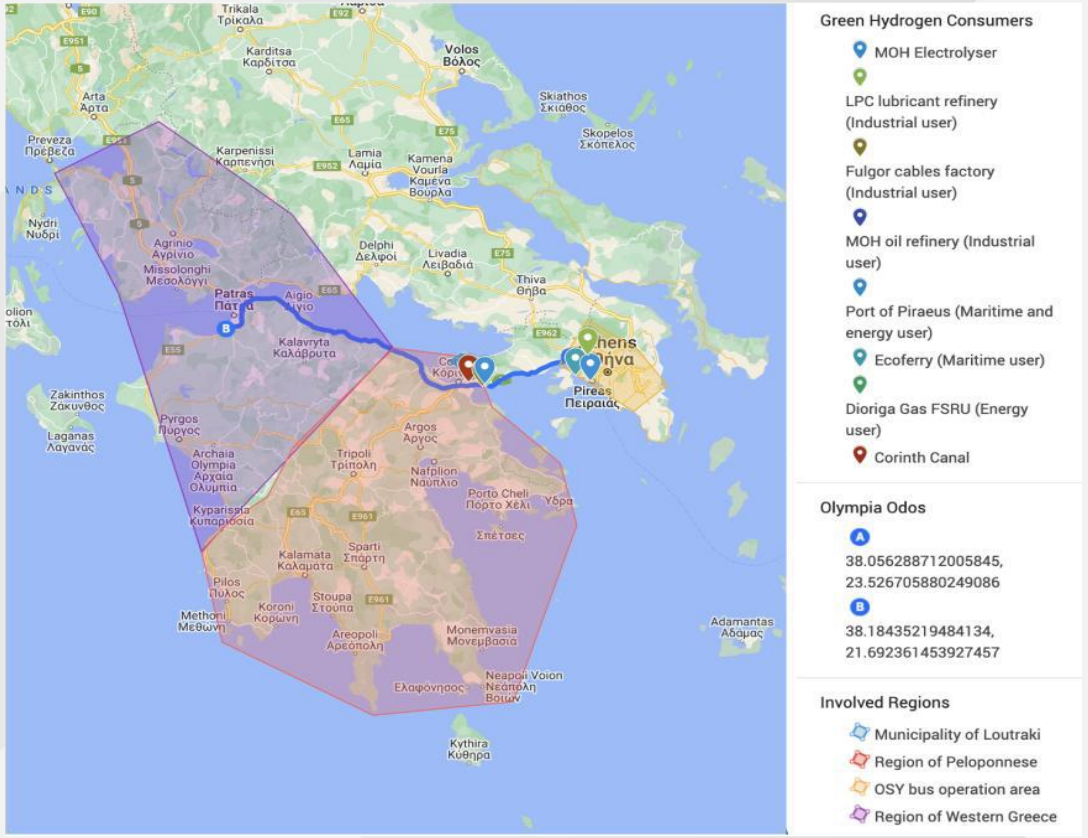
# Project Summary

- To establish a **Hydrogen Valley in Greece**, bringing together business, knowledge and regional interests. Nucleated around MOH's refinery the TRIERES -initially small scale- Valley is planned to reach the Balkans, South-Eastern Europe, and Eastern Mediterranean.
- An **annual production of 2,410 tons** of Green Hydrogen (EPHYRA) will be utilized in the **production of low and no Carbon footprint energy and industrial products** and will be injected in the **natural gas grid** creating a Hydrogen Backbone of full EU interest.
- **Partners** from **industry, academia and research, technology providers, and public authorities** will collaborate to implement a **holistic ecosystem with various applications**.
- The applications will showcase hydrogen's potential in collaborative efforts in the **mobility, energy and industry sectors** to transform a fossil-fuel dependent economy through a cutting-edge energy and hydrogen ecosystem.

## TRIERES valley geographical coverage

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# High-level objectives

- Activate the development of a **hydrogen market in the country of Greece**, by demonstrating how the various pillars of Hydrogen fit together and can be integrated
- Strengthen the **visibility** and improve the **knowledge** and the public **awareness** of strategic actors of the hydrogen value chain as well as the **public perception** of emerging Hydrogen ecosystems
- Create a **Replicable model** for the Hydrogen Technologies to be multiplied and reproduced throughout Small and Large scale Valleys and flagship hydrogen projects
- Creation of **scalable, transferable, and adaptive Digital Twin (DT) models** of the project to simulate the hydrogen distribution infrastructure and services, enable the scaling up and the evolution of infrastructure and business scenarios

# Support to policy and market development

## The project is supporting…

***EU POLICY***

- Main priority of the European Commission for scaling up hydrogen ecosystems across Europe through emerging strategic value chains.

***NATIONAL POLICY***

- National Plan for Energy and Climate (NPEC) in 2019, aiming to battle climate change, safeguarding energy supply and energy security
- National Hydrogen Strategy (to be adopted)
- Greek Climate Law 4936/2022

***LOCAL - REGIONAL HYDROGEN ECONOMY***

- Nucleated around the Motor Oil Hellas (MOH) Refinery in Agioi Theodoroi, Greece
- With a tremendous upward perspective over a large part of the Balkans, South-Eastern Europe and the wider area of Eastern Mediterranean.

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# The project in a nutshell


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5
countries

26
partners

2,410
tons of green H2 supplied per year

9,980
Tons/year $CO_2$ removed from industry & mobility via fuel substitution with green H2

58M ~ 5 years
July 2023 – April 2028

8M
total EU grant in €

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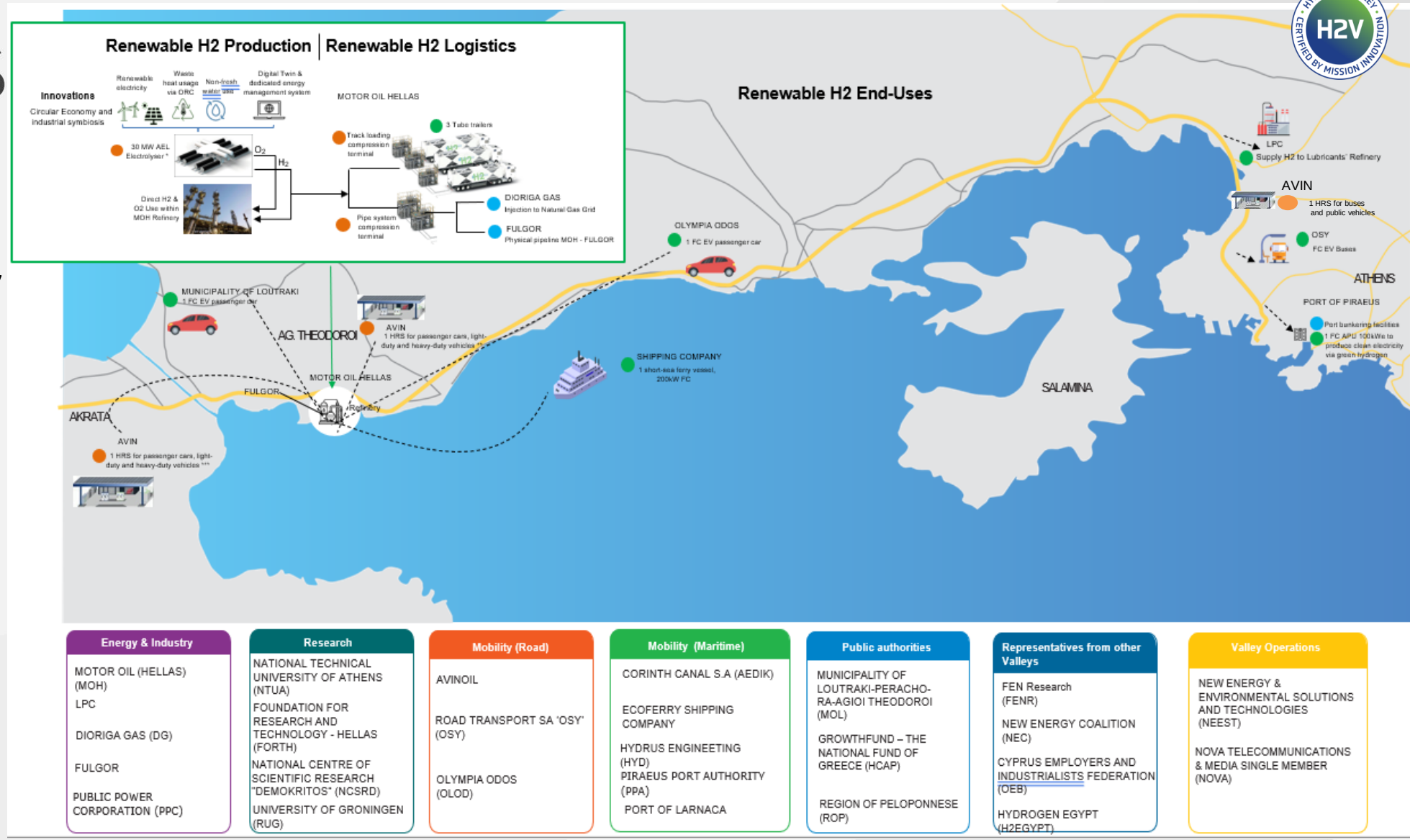
# Overview of small-scale valley operations




**Explanatory notes:**

- Application funded by TRIERES project
- Study funded by TRIERES project
- Application funded by other sources

Hydrogen supply via physical pipeline

Hydrogen supply via virtual pipeline

| Energy & Industry | Research | Mobility (Road) | Mobility (Maritime) | Public authorities | Representatives from other Valleys | Valley Operations |
|---|---|---|---|---|---|---|
| MOTOR OIL (HELLAS) (MOH) | NATIONAL TECHNICAL UNIVERSITY OF ATHENS (NTUA) | AVINOIL | CORINTH CANAL S.A (AEDIK) | MUNICIPALITY OF LOUTRAKI-PERACHO-RA-AGIOI THEODOROI (MOL) | FEN Research (FENR) | NEW ENERGY & ENVIRONMENTAL SOLUTIONS AND TECHNOLOGIES (NEEST) |
| LPC | FOUNDATION FOR RESEARCH AND TECHNOLOGY - HELLAS (FORTH) | ROAD TRANSPORT SA 'OSY' (OSY) | ECOFERRY SHIPPING COMPANY | GROWTHFUND – THE NATIONAL FUND OF GREECE (HCAP) | NEW ENERGY COALITION (NEC) | NOVA TELECOMMUNICATIONS & MEDIA SINGLE MEMBER (NOVA) |
| DIORIGA GAS (DG) | NATIONAL CENTRE OF SCIENTIFIC RESEARCH "DEMOKRITOS" (NCSRD) | OLYMPIA ODOS (OLOD) | HYDRUS ENGINEETING (HYD) | REGION OF PELOPONNESE (ROP) | CYPRUS EMPLOYERS AND INDUSTRIALISTS FEDERATION (OEB) | |
| FULGOR | UNIVERSITY OF GRONINGEN (RUG) | | PIRAEUS PORT AUTHORITY (PPA) | | HYDROGEN EGYPT (H2EGYPT) | |
| PUBLIC POWER CORPORATION (PPC) | | | PORT OF LARNACA | | | |

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* EPHYRA project is supported the Clean Hydrogen Partnership and its members Hydrogen Europe and Hydrogen Europe Research under Grant Agreement No. 101112220
** REA project has received funding from the Connecting Europe Facility – Transport programme under Grant Agreement No. 101079451
*** REAH2 project has received funding from the Connecting Europe Facility – Transport programme under Grant Agreement No. 101119200
**** REAH3 project is under Grant Agreement preparation from the Connecting Europe Facility – Transport programme.

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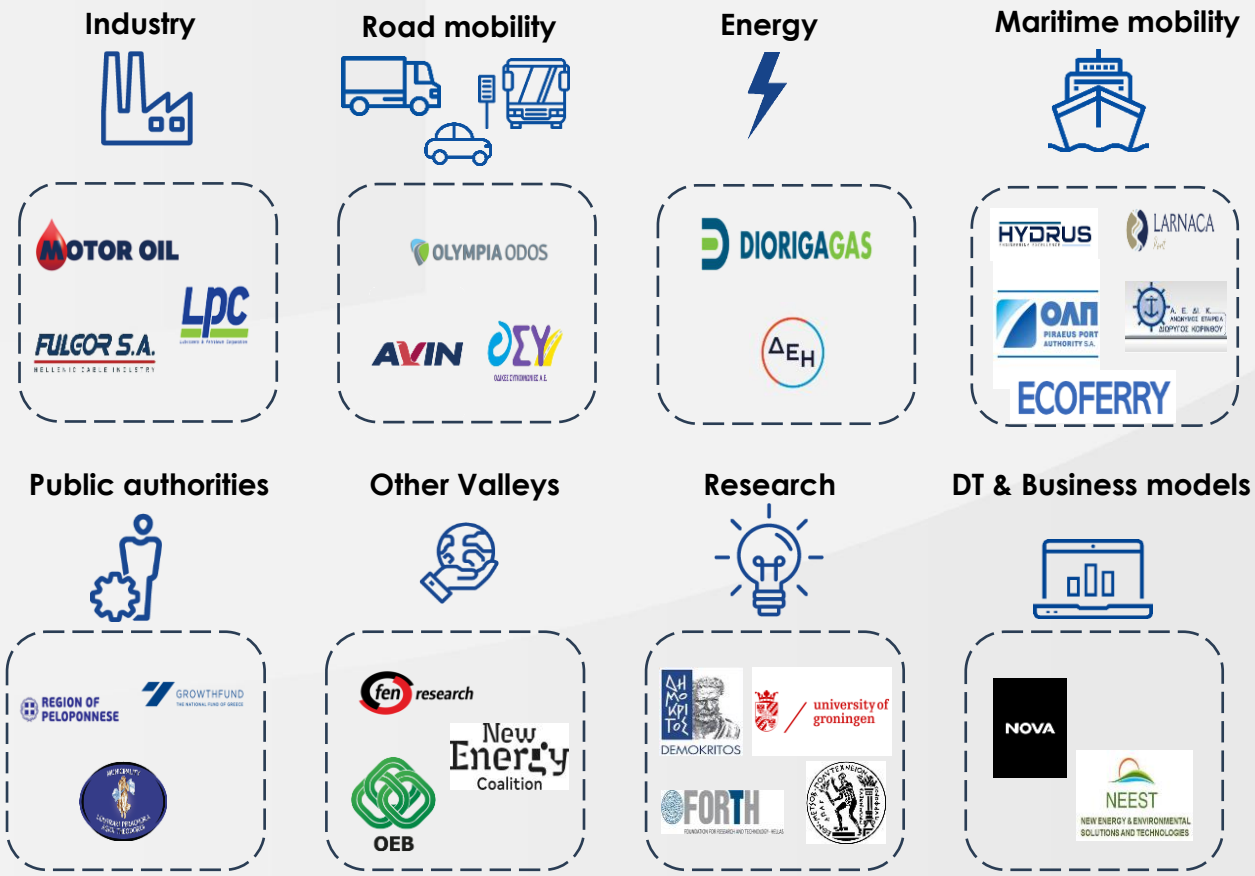
# Versatility in end-use applications




**Industry**:

- Consumption of renewable hydrogen by **Motor Oil Hellas refinery** in Ag. Theodoroi and the **lubricant refinery of LPC** in Aspropyrgos during TRIĒRĒS project, aiming to reduce carbon dioxide emissions from their production processes.

**Road Mobility**:

- Up to three (3) **urban buses** operated within the metropolitan area of Athens.
- One (1) **light hydrogen-powered vehicle** used for day-to-day operations along the TEN-T network.
- One (1) **passenger car** operated by the Municipality of Loutraki– Perachora – Ag. Theodoroi.

**Energy**:

- One (1) **small-scale clean energy production unit** (100 kWe FC-APU) to produce electricity via green hydrogen at the Port of Piraeus.

**Maritime Mobility**:

- One (1) **short sea ferry vessel** retrofitted with a 200kW FC system.

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# Synergies with other EU projects

**EPHYRA** - Establishing European Production of Hydrogen from RenewAble energy and integration into an industrial environment

**GA No: 101112220**

**DURATION** 60 MONTHS
Start: 01 June 2023
End: 30 May 2028

**EC GRANT**
17.757.840€

**FUNDED UNDER**
Horizon Europe, Clean Hydrogen JU

**CONSORTIUM**
10 partners from 7 countries

**IRIS** - Innovative low caRbon hydrogen and methanol productIon by large Scale carbon capture

**GA No: 101133015**

**DURATION** 168 MONTHS
Start: 01 January 2024
End: 30 June 2037

**EC GRANT**
126.790.000€

**FUNDED UNDER**
Innovation Fund / Large scale Projects

**CONSORTIUM**
MOTOR OIL

**REA** - Construction of an HRS for passenger, light-duty and especially long-haul heavy-duty vehicles in Agioi Theodoroi (Corinth, Peloponnese, Greece)

**GA No: 101079451**

**DURATION** 28 MONTHS
Start: 01 November 2021
End: 31 October 2024

**EC GRANT**
1.455.492€

**FUNDED UNDER**
Connecting Europe Facility

**CONSORTIUM**
AVINOIL

**REAH2** - Construction of a HRS for passenger cars, light-duty and heavy-duty vehicles in Akrata (Achaia, Western Greece)

**GA No: 101119200**

**DURATION** 31 MONTHS
Start: 01 April 2023
End: 31 October 2025

**EC GRANT**
1.700.585€

**FUNDED UNDER**
Connecting Europe Facility

**CONSORTIUM**
AVINOIL

**REAH3** - Construction of an HRS for public transport buses in a bus depot (Attika, Greece)

**Under GA preparation**

**DURATION** 31 MONTHS
Start: 01 March 2024
End: 31 October 2026

**EC GRANT**
3.575.525€

**FUNDED UNDER**
Connecting Europe Facility

**CONSORTIUM**
AVINOIL

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# Synergies with other EU projects

## Valorising different funding sources…

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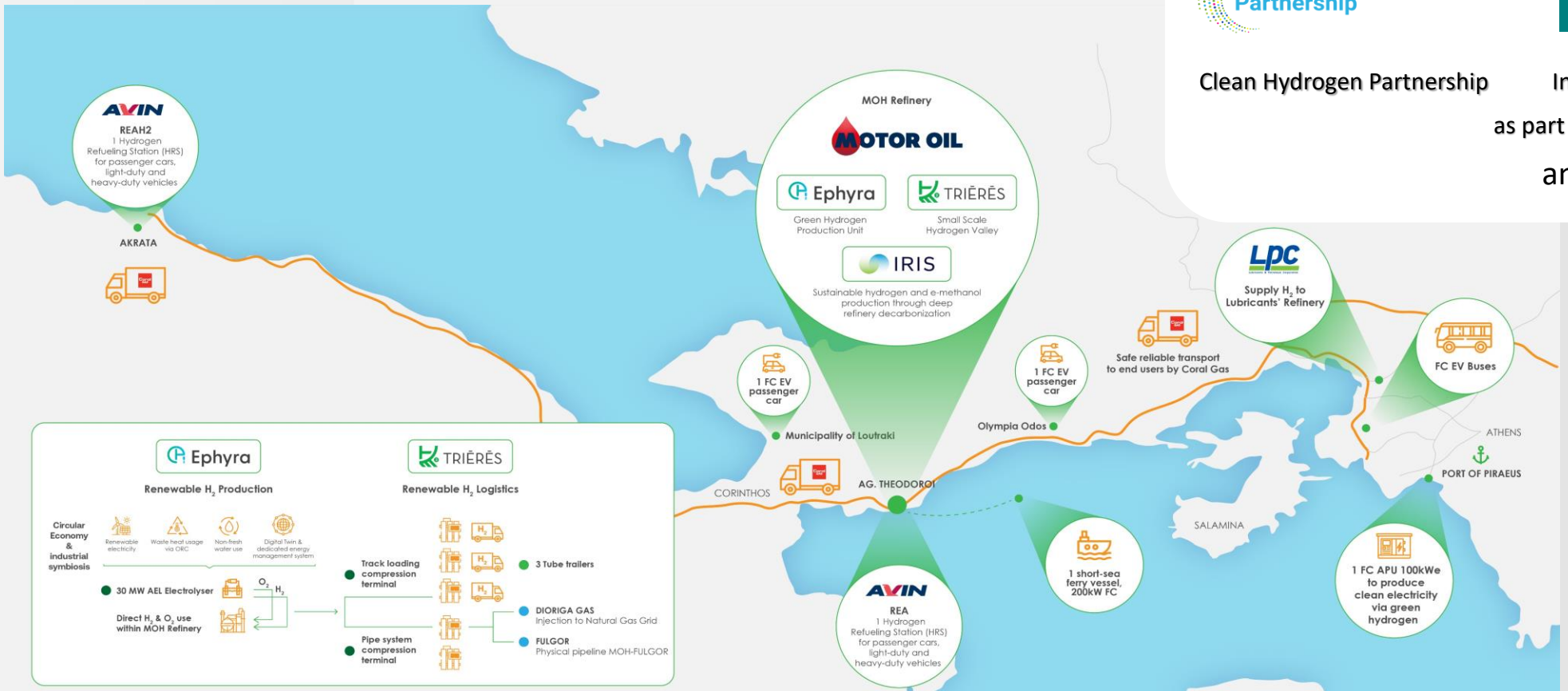
Innovation Fund

CEF - Transport

as part of BLUE MED CEEAG

and own funds





**Disclaimers for EC funding:**

- EPHYRA project is supported the Clean Hydrogen Partnership and its members Hydrogen Europe and Hydrogen Europe Research under Grant Agreement No. 101112220
- TRIERES project is supported the Clean Hydrogen Partnership and its members Hydrogen Europe and Hydrogen Europe Research under Grant Agreement No. 101112056
- IRIS project receives funding from the European Innovation Fund programme under Grant Agreement No. 101133015
- REA project has received funding from the Connecting Europe Facility – Transport programme under Grant Agreement No. 101079451
- REAH2 project has received funding from the Connecting Europe Facility – Transport programme under Grant Agreement No. 101119200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# Current Challenges for the development of the H2market in Greece

## Administrative/Regulatory

- Non-harmonised **regulatory framework**
- Delayed or complex **permitting and licensing procedures**
- Lack of **coordination** between different authorities (Central Government, Regional, Local Administration)

## Technical

- Limited **available technical solutions at high TRL** (fuel cells, electrolysers etc.)
- **High dependency risk in third countries** due to manufacturers/technology suppliers based outside EU
- **Long delivery timelines of manufacturers** due to high market demand
- **Lack of Safety and standards**: need for further development at EU and national level, covering whole value chain (production, handling, storage) – easier public acceptance and regulatory approvals

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# Current Challenges for the development of the H2market in Greece

## Financial

- **High production costs:** particularly through electrolysis using renewable energy sources, currently higher than alternative methods. Overcoming cost barriers to achieve competitiveness with conventional fuels is crucial.
- **Access to finance**: Utilise all financing sources for optimal mix! Identify best funding tools for each project component (e.g., CEF, Horizon Europe, RRF, Loans and equity)

## Social

- **Limited public awareness and acceptance**
  - ➢ Need for wider dissemination for general public
  - ➢ Need for upskilling and reskilling professionals
- **Just transition**: Ensuring a fair and inclusive transition is critical for social acceptance and support.

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# Advancements of the first year of the project

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### Commitment of all partners:

- industry, research and academia to co-develop innovative applications and de-risk investments

### Public authorities:

- provide feedback for legal and regulatory issues that enable the hydrogen economy – position paper to national authorities under preparation
- joint planning of 'mini-symposium' roundtables with public authorities on Hydrogen

### Road mobility:

- on-going market research for light and heavy-duty vehicles (tech specs, costs, delivery timelines from manufacturers),
- completion of acquisition of 3 tube trailers

### Energy & industry:

- Final selection of Electrolyser technology achieved (Q2 2024)
- initiation of permitting and licensing procedures for industrial applications

### Research and Valley operations:

- data collection for digital twin, valley operations simulation, electrolyser coupling with RES scenarios, investigation for PPAs, logistics, etc.

### Reps from other Valleys:

- Knowledge exchange with existing valleys (Austria, Netherlands) and connections with emerging regions (Cyprus Crete, Egypt), planning of study visit in Austria (Q3 2024)

### Combination of funding:

TRIERES valley is valorising additional various sources:

- EPHYRA project CH JU
- REA & REAH2 projects CEF (part of BLUE MED CEEAG)
- own funds

### Shipping:

- On-going market research for FC APU technologies, search for additional state aid to support short sea vessel development

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# Our aspirations for the way forward for hydrogen valleys

Clean Hydrogen Partnership serves as a valuable tool for effectively leveraging funding and promoting collaboration among diverse public and private stakeholders to develop hydrogen infrastructure, conduct feasibility studies, and facilitate dissemination and training activities.

What is important for the future operation, collaboration and enlargement of hydrogen valleys:

- **Expansion** – Provide support in line with GBER to replicate and multiply end-use case applications
- **Inclusion** – Provide incentives for supply chain vendors to participate and increase readiness, resilience and transparency for the procurement of components critical to the hydrogen economy
- **Synergies** – Work with CINEA to explicitly promote synergies between hydrogen valleys and CINEA programmes
- **Connection** – Promote formal hydrogen corridors connecting hydrogen valleys to delimit the geographical deployment of future hydrogen projects

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# *Thank you!*

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https://www.trieres-h2.eu/

https://www.linkedin.com/company/trieres-h2-valley/

https://www.youtube.com/@TRIERES-H2

Trieres Greek Hydrogen valley

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