THE FAST TRACK TO THE HYDROGEN ECONOMY

EUROPEAN HYDROGEN ENERGY CONFERENCE

EHEC 2024
EUROPEAN HYDROGEN ENERGY CONFERENCE

AeH2
SPANISH HYDROGEN ASSOCIATION

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TRIĒRĒS

Towards the development of a hydRogen valley demonstrating applications in an intEgRated EcoSystem in Greece

Plenary Session 3:

Cross-sectoral Synergies: The role of hydrogen valleys

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Motor Oil Group in Numbers

8 Countries[1]

~2,800
Group Employees

[1]Greece, North Macedonia, Croatia, Cyprus, Serbia, Albania, Bulgaria, Romania
[2] Based on €10.2 bn. revenue and GR GDP of €183 bn. (2021)
[3] Includes maintenance and growth capex as well as acquisitions (2019, 2020, 2021)

€ 17bn
turnover
(2022)

sales to
>70 countries

1,500+
service stations
in Greece and abroad

history of
50+ years

€ 678m
adj. EBITDA
(last 5yr avg.)

1 oil refinery
1/3 of Greece's refining capacity
185 kbpd, Nelson Complexity Index 12.61

772MW
RES oper. Capacity & 2.3 GW in execution

listed on the ASE
since 2001

1 biofuels plant
80,000MT annual capacity

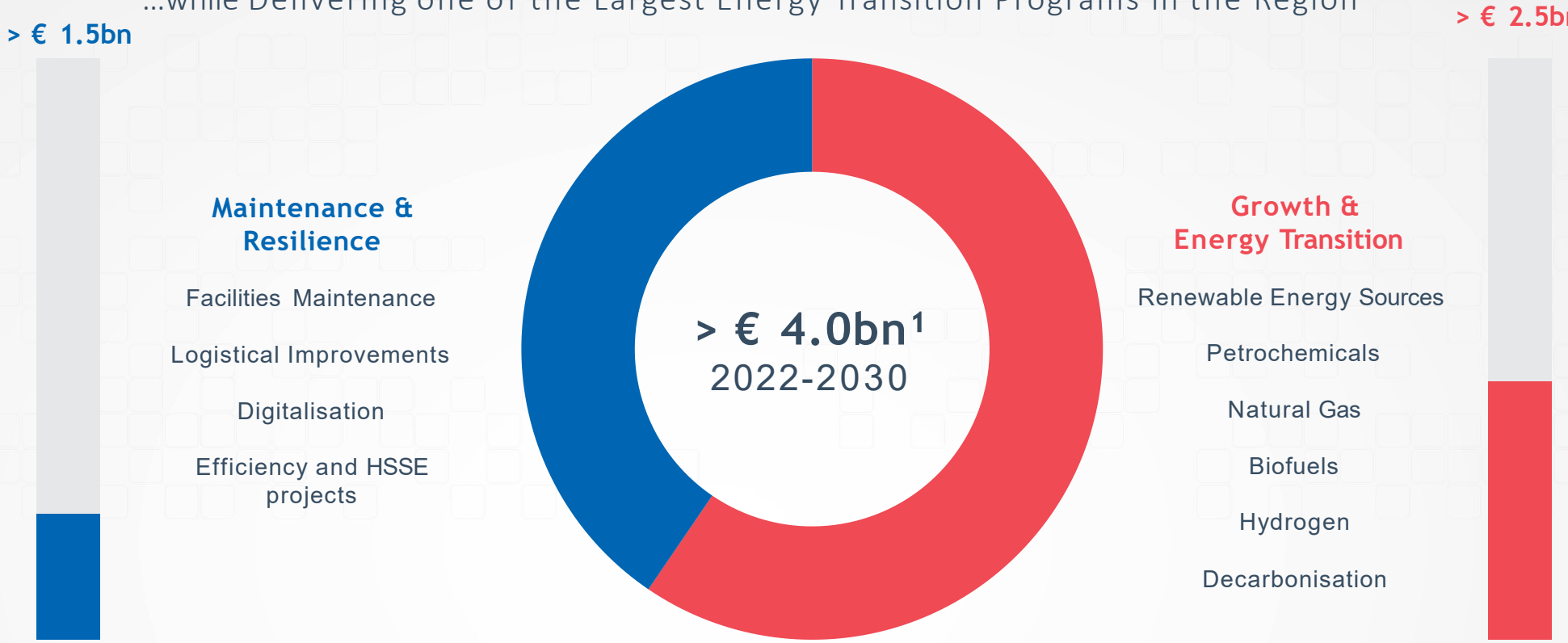
1 lubricants' plant
Europe's largest & most advanced regeneration plant

€ 2.5bn+
investments in 2013-22

€ 2.5bn
market cap.

Transforming into a Multi-Energy Leader in Southeastern Europe

…while Delivering one of the Largest Energy Transition Programs in the Region



In the last 12 months, we made significant progress towards our energy transition plan, delivering results in advance of the original timeline

Notes: 1. Including mergers, acquisitions and investments.

Our Path Forward is Realised Through our Strategic Pillars

Core Resilience & Flexibility

Low-Carbon Energy Strategies

Refining, Supply & Trading

Operational Efficiency and Flexibility

Decarbonisation

Digitalisation

Diversification into Petrochemicals

Mobility & Retail

Enhanced Customer Value Proposition

Electrification and e-mobility

Lower Carbon Fuels

Renewable Energy

Diversified Operational RES Portfolio

Strong Pipeline for Organic Growth

Technological and Geographic Diversification

Alternative Fuels & Circular Economy

Natural and Renewable Gas

Hydrogen

Advanced Biofuels and e-fuels

Waste Management and Recycling

Lubricants Regeneration

Biofuels Feedstock Development

Driving Growth and Change Across a Diverse, Multi-Energy Portfolio

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Focus on Green Transformation/Hydrogen 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

BUDGET
Total eligible costs
24 631 840.00€

FUNDED UNDER
Horizon Europe, Clean Hydrogen JU

CONSORTIUM
10 partners from 7 countries

TRIERES - Towards the development of a hydRogen valley demonstratIng applications in an intEgRated EcoSystem in Greece

GA No: 101112056

DURATION 58 MONTHS
Start: 01 July 2023
End: 30 April 2028

BUDGET
Total eligible costs
10 492 431.25€

FUNDED UNDER
Horizon Europe, Clean Hydrogen JU

CONSORTIUM
26 partners from 5 countries

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: 29 February 2024

BUDGET
Total eligible costs
2 910 984.00€

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

BUDGET
Total eligible costs
3 401 170.00€

FUNDED UNDER
Connecting Europe Facility

CONSORTIUM
AVINOIL

CLEA - Construction of electricity recharging stations with super chargers along the TEN-T road network in Greece

GA No: 101079449

DURATION 31 MONTHS
Start: 01 November 2021
End: 30 April 2024

BUDGET
Total eligible costs
2 790 000.00€

FUNDED UNDER
Connecting Europe Facility

CONSORTIUM
AVINOIL, CORAL

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

GA No: Under GA preparation, signature by 15 Dec 2023

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

BUDGET
Total eligible costs
210 000 000.00€

FUNDED UNDER
Innovation Fund / Large scale Projects

CONSORTIUM
MOTOR OIL

"TRIERES" - Project Summary

SCOPE

- 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.

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

"TRIERES" – 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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"TRIERES" Partners and location of the Greek Hydrogen Valley

TRIĒRĒS

5 Countries

26 Partners

2,410 Tons of green H2 produced per year

50,000 Tons of CO2 saved

10,492,431 Total budget in euros

58 months (~ 5 Years)

Duration from July 2023 to April 2028

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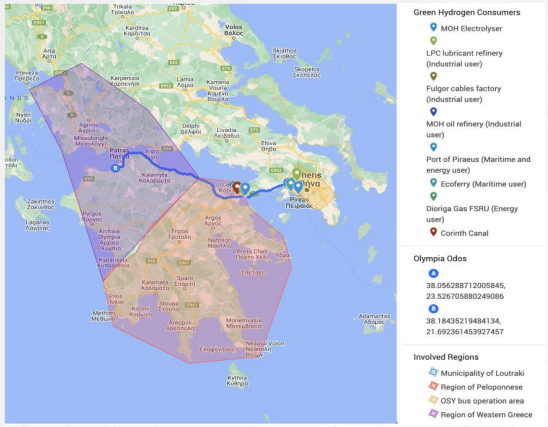
TRIERES Small-Scale Valley Value Chain

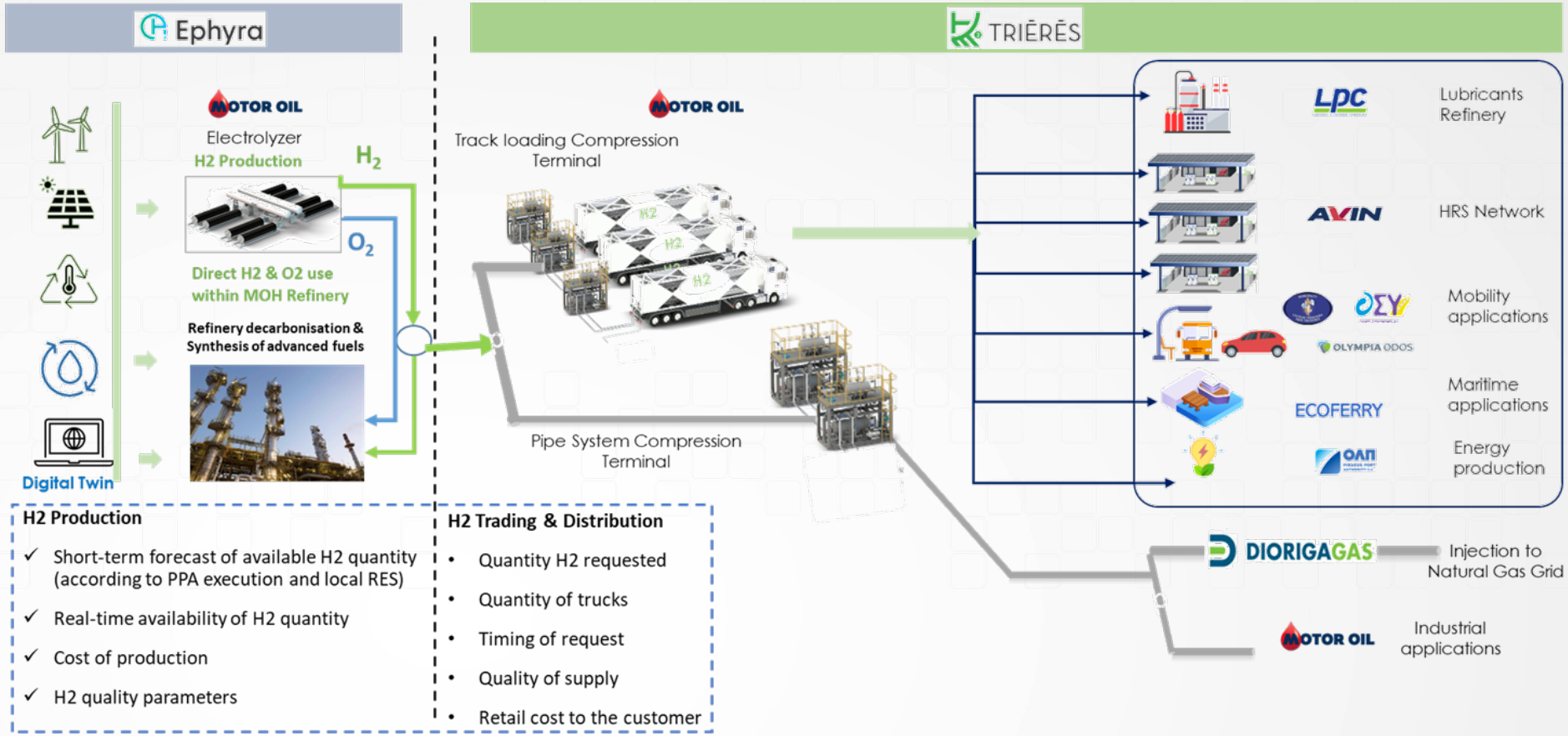
TRIERES valley geographical coverage



EPHYRA project: The 30 MW Electrolyser will be developed and demonstrated in the framework of the EU project EPHYRA co-funded by the Clean Hydrogen Partnership and its members Hydrogen Europe and Hydrogen Europe Research under Grant Agreement No. 101112220

REA project: Construction of an HRS for passenger, light-duty and especially long-haul heavy-duty vehicles in Agioi Theodoroi, funded by CEF under Grant Agreement No 101079451

REAH2 project: Construction of a HRS for passenger cars, light-duty and heavy-duty vehicles in Akrata (Achaia, Western Greece), funded by CEF under Grant Agreement No 101119200



H2 Production

- ✓ Short-term forecast of available H2 quantity (according to PPA execution and local RES)
- ✓ Real-time availability of H2 quantity
- ✓ Cost of production
- ✓ H2 quality parameters

H2 Trading & Distribution

- Quantity H2 requested
- Quantity of trucks
- Timing of request
- Quality of supply
- Retail cost to the customer

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"TRIERES valley" – Versatility in end-use applications

Industry

Road mobility

Energy

Maritime mobility

Public authorities

Other Valleys

Research

DT & Business models

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:

- 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.

"TRIERES valley" – Current Challenges for the development of the hydrogen market in Greece

Administrative/ Regulatory

- **Lack of regulatory framework**: need to adopt **National Hydrogen Strategy** and **regulations governing production, distribution and use of hydrogen**
- **Permitting and licensing procedures**: delayed or complex administrative procedures, lack of stable standards for hydrogen infrastructure projects and vehicles
- **Coordination between different authorities** to ensure coherent policy framework e.g., 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 low market demand
- **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

"TRIERES valley" – Current Challenges for the development of the hydrogen market in Greece

Financial

- **Cost of production**: cost of producing hydrogen, 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:** Building public awareness and acceptance of hydrogen as a clean energy carrier is important. **Communication & dissemination activities** for general public, **trainings for reskilling** professionals help overcome resistance to hydrogen projects.
- **Just transition**: Ensuring a fair and inclusive transition is critical for social acceptance and support.

"TRIERES valley" – What has been achieved during the first 8 months of the project?

- **Commitment of all partners:**
  - Capable partners from industry, research and academia to co-develop innovative applications and de-risk investments, Engagement of public authorities to receive feedback for legal and regulatory issues that enable the hydrogen economy
- **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
- **Road mobility:** initiation of market research for light and heavy-duty vehicles (technical specs, costs, delivery timelines from manufacturers), completion of acquisition of 3 tube trailers
- **Energy & industry:** towards completion of Electrolyser technology selection (Q1 2024), initiation of permitting and licensing procedures for industrial applications, e.g., Approval of environmental terms and conditions of facilities, data collection for injection to natural gas grid scenarios
- **Research and Valley operations:** data collection for digital twin, valley operations simulation, electrolyser coupling with RES scenarios, investigation for PPAs, logistics, etc.
- **Public authorities**: joint planning of 'mini-symposium' roundtables with public authorities on Hydrogen
- **Reps from other Valleys**: connections with existing valleys (Austria, Netherlands) and emerging regions (Cyprus Crete), planning of study visit in Austria (Q2 2024)
- **Shipping**: market research for FC APU technologies, search additional state aid to support short sea vessel development

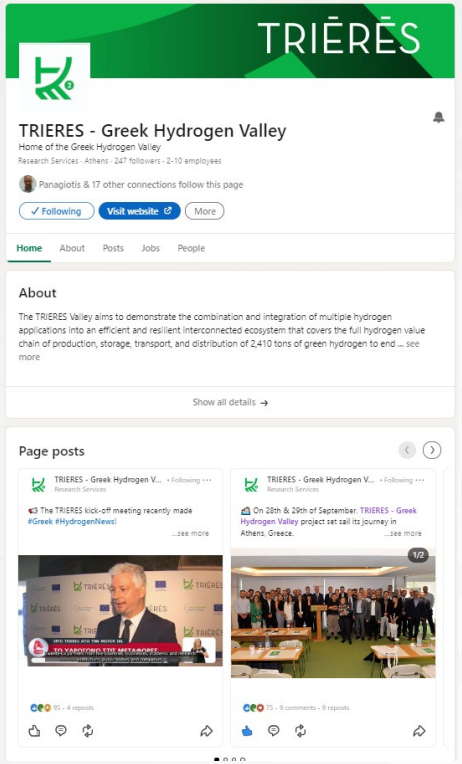
"TRIERES valley" – Our aspirations for the way forward for hydrogen valleys

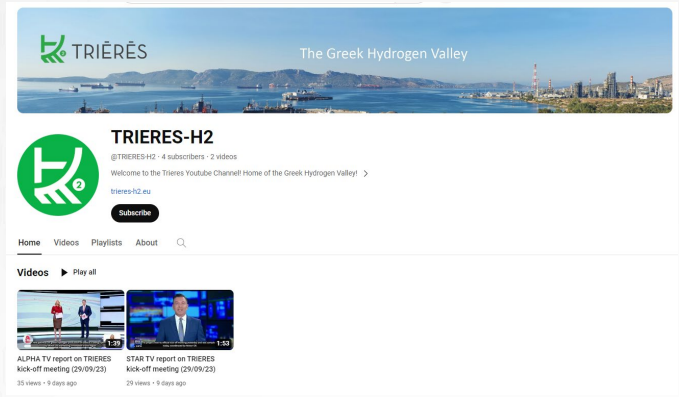
Clean Hydrogen Partnership serves as a **valuable tool** for **effectively leveraging funding** and **promoting collaboration** among **diverse public and private stakeholders** to develop **hydrogen infrastructure**, **conduct feasibility studies**, and **facilitate dissemination** and **training activities.**

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

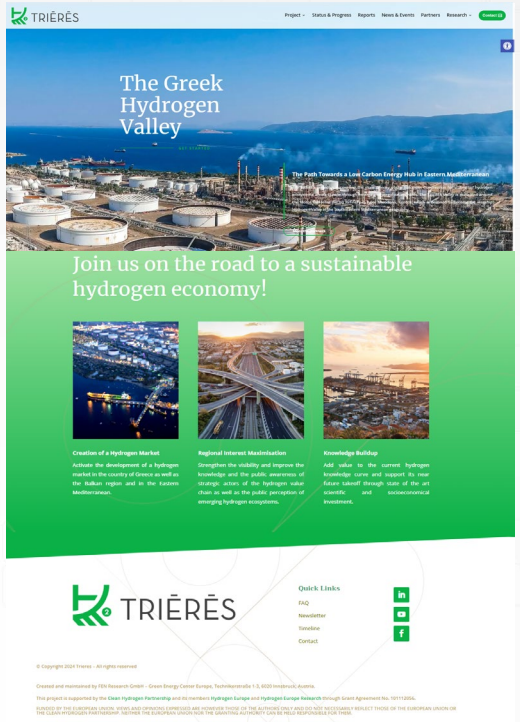
- **Expansion** - Provide support in line with GBER to replicate and multiply end-use case applications
- **Inclusion** - Provide incentives for supply chain vendors to participate and increase readiness, resilience and transparency for the procurement of components critical to the hydrogen economy
- **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

TRIĒRĒS is communicated/disseminated using various channels

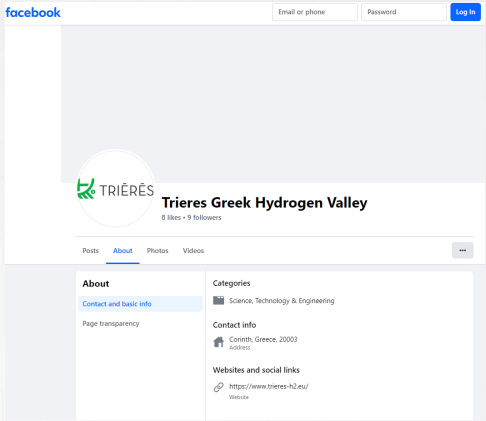




https://www.youtube.com/@TRIERES-H2



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



Trieres Greek Hydrogen Valley | Facebook

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

Thank you for your attention!

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