

Hellenic • • Hydrogen

Renewable Hydrogen Production in Greece

Prague, 5 November 2024

AFFORDABLE HYDROGEN SUPPLY @ LARGE SCALE



Czech Hydrogen Backbone Dialogue

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 - H₂ Large-Scale Production | *Sustainable & Affordable* | **Storage**
 - H₂ Large-Scale Production | *Storage & Transportation* | **Engineering**
 - North_1 | *Infrastructure Development* | **Critical Aspect**



- ✓ Motor Oil Hellas (MOH) is an energy group based in Greece. Founded in 1970, **its refinery, one of the most advanced in Europe**, began operation in the Corinth region in 1972.
- ✓ MOH exports to more than **70 countries**, operates more than **1,500 gas stations** in Greece and **employs over 3,000 workers**.
- ✓ The Group is also active in renewable energy sources development **by investing in alternative energy & renewable fuels** through its subsidiaries (AVIN, Coral, Coral Gas, LPC, MORE Energy, nrg Trading S.A., Thalys ES S.A.)



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Hellenic Hydrogen S.A. is a company engaged in the development, construction & operation **of renewable hydrogen production projects**. The company was founded in January 2023 and is a strategic joint venture between two major energy companies: **MOH and PPC**.

Leveraging **the expertise and experience of its shareholders** and investing in highly specialized professionals, Hellenic Hydrogen is moving forward with the implementation of our business and strategic plan. A plan that is **supported & aligned by our shareholders strategic move to a greener future**.

This plan includes the **development of large-scale renewable hydrogen production projects**, targeting high-thermal industry processes, e-fuels and mobility



- ✓ Public Power Corporation S.A. (PPC) is the **leading electricity production and supply company in Greece**. Founded in **1950**, PPC employs **13k workers**, serving **5.7 million customers** nationwide.
- ✓ PPC has a generating capacity of **10.5 GW in Greece**, including thermal, hydroelectric power stations & RES installations.
- ✓ As part of its redefined objectives, PPC is **advancing decarbonization** by accelerating the **phase-out of lignite units** and promoting investments in Renewable Energy Sources.



Industrial Processes



- **Hard-to-abate Industries:** Renewable H₂ can replace fossil fuels in various industrial processes, such as **steel and cement** production, where **high-temperature heat** is required
- **Refineries:** Renewable H₂ has the potential to **replace grey H₂** in refineries, especially as the global energy transition towards cleaner and more sustainable sources accelerates
- **Backup Power:** Hydrogen-powered fuel cells or combustion engines can provide **backup power in critical infrastructure**

Transportation



- **Heavy-Duty Vehicles:** Renewable H₂ can **power heavy-duty vehicles** like trucks, buses, and trains, offering long-range capabilities and reduced emissions
- **Aviation:** e-SAF & other synthetic fuels can be produced using **renewable H₂ & captured CO₂**, through a process called power-to-liquid (PtL) or power-to-X (PtX)
- **Maritime:** Renewable H₂ is a key feedstock in the production of chemicals, including **ammonia, methanol** which hold potential for decarbonizing Maritime Transport

Energy Storage & Grid Balancing



- **Grid Balancing Services:** Renewable H₂ can serve as a **valuable tool for grid balancing services**, helping to address the **intermittency and variability of renewable energy sources** such as solar and wind power. It can be produced during times of excess renewable energy generation, addressing the foreseen curtailments and be stored. It can then be converted back to electricity using fuel cells or combustion engines during peak demand or when renewable energy generation is low, helping to balance the electricity grid

Blending with Natural Gas



- **Injection to Natural Gas grid:** Renewable H₂ **injection into the natural gas grid** involves blending hydrogen, utilizing the existing natural gas infrastructure. This will enable the decarbonization of the gas sector and the increase of energy security. Examples of its usage can be found in the **fossil fuels-based Power Generation** (i.e., CCGTs) and in **District Heating applications** (i.e., CHP Units)

Circular Economy



- **Waste-to-Methanol:** By utilizing renewable H₂ as a feedstock for methanol production from waste, this process offers a sustainable and environmentally friendly **alternative to traditional fossil fuel-based methanol production methods**. It helps, minimize **waste disposal, and promote circular economy principles** by valorizing waste streams into valuable products
- **Hydrogen as a Process Heat Source:** Renewable H₂ can be used as a heat source for **waste treatment processes**, such as pyrolysis and thermal gasification

International Trade & Exports



- **Green Hydrogen as an Export Commodity:** Countries with abundant renewable energy resources can produce green hydrogen and **export it to regions with limited renewable energy potential**. This supports **energy diversification**, reduces dependence on fossil fuel imports, and fosters international cooperation in achieving climate goals

Legend

H₂ derivatives



Project Overview: Hellenic Hydrogen has decided to prioritize the investigation of the development of a 50 MW Electrolysis Plant (Amyntaio, W. Macedonia) in a **decommissioned lignite area** through the utilization of Power from RES, seeking to leverage existing Shareholder's assets in the area and create synergies with existing & future hydrogen-related initiatives in Western Macedonia. North-1 will be **the very first renewable hydrogen production commercial plant in Southeast Europe**



Type: Brownfield



Electrolyser Size (MW): 50 (ability for +150 MW)



Off-taking: CHP Unit (Kardia) & heavy-duty vehicles (W. Macedonia)



Location benefits: Expandability, RES abundance, proximity to Natural Gas grid, existing electric grid & water utilities, Skilled workforce & existing facilities for re-use



Economic Feasibility – Sustainable design

B2B Oriented Networks – H₂ pipelines are expected to connect Producers with Thermal End Customers.

Ports & Terminals – Dedicated efficient Networks.

Public-private partnerships, **government incentives**, and a phased approach to infrastructure development can help reduce the economic burden.

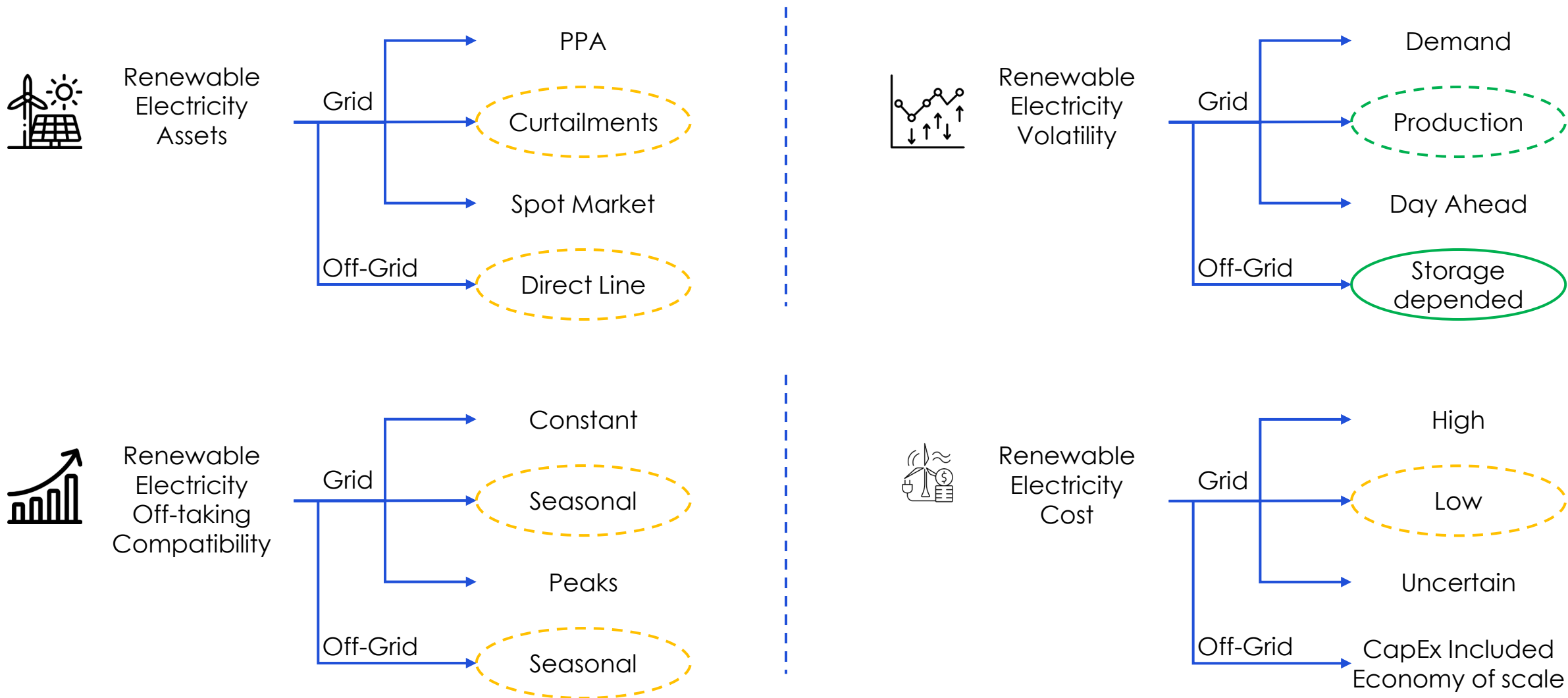
H₂ Points of Delivery – Strong Potential

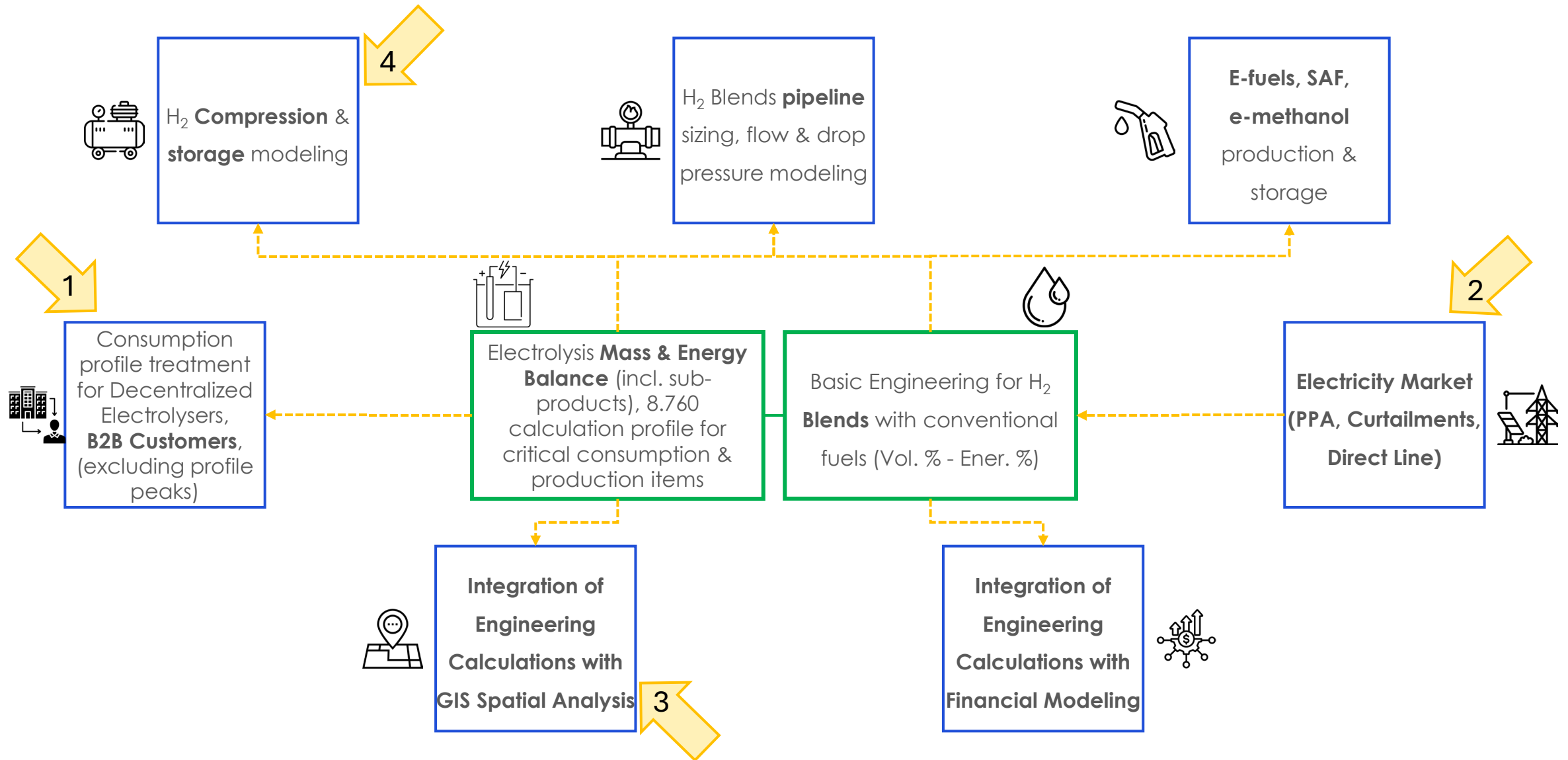
On the way to a Zero-Emission production, H₂ is the only fuel that can fully substitute fossil fuels in the **High Thermal Industry**.

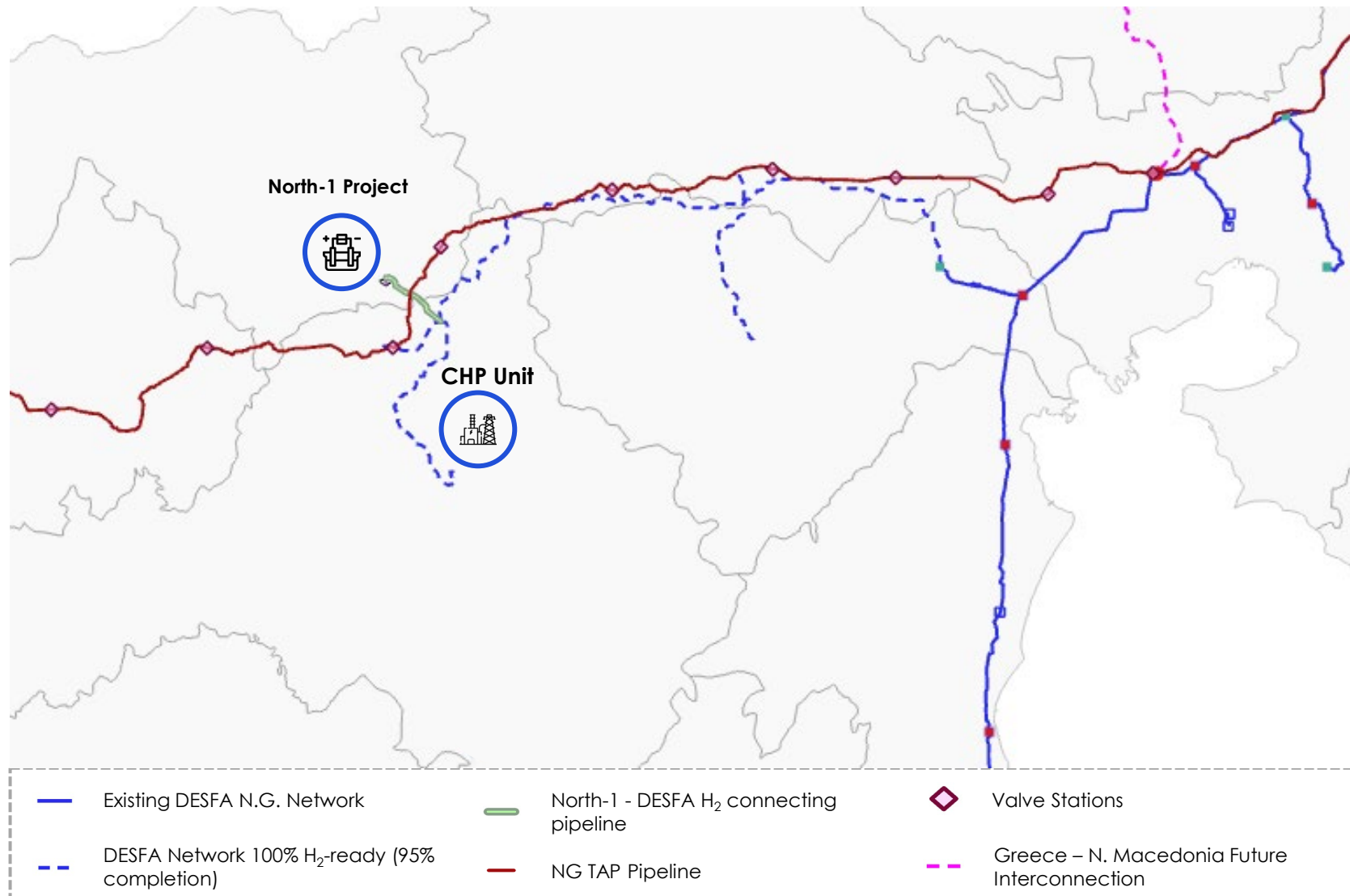
Industry sectors such as Metallurgy, Glass, Pottery and Pasteurization have no other path to follow than preparing to accept H₂-ready technologies.

E-fuels & Ammonia are standing as a second fundamental for H₂ consumption.

Naval transports, Aviation and Heavy-Duty Vehicles can find into **H₂ derivatives** all the answers to their energy transition questions.







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*Thank you for your
attention!*