



Hellenic • • Hydrogen

**“Insights and conclusions from  
the ongoing EU H<sub>2</sub> Projects”**

June 2025

# Key Insights into the Global Low-Emissions Hydrogen Market

## More Projects and FIDs emerging, yet key challenges remain



### Current Demand & Supply Outlook

- Global hydrogen demand **reached 97 Mt in 2023, up 2.5% from 2022**
- However, **less than 1 Mt** was produced from low-emissions sources (electrolysis or CCUS-based)



### Predominant Sectoral Use

- Demand is **still heavily concentrated in refining and chemical sectors**, mostly met by unabated fossil-based hydrogen



### Low-Emissions H2 Market Outlook in 2030

- Announced projects could scale low-emissions hydrogen production to **49 Mt/year by 2030, driven by 520 GW** of electrolysis capacity

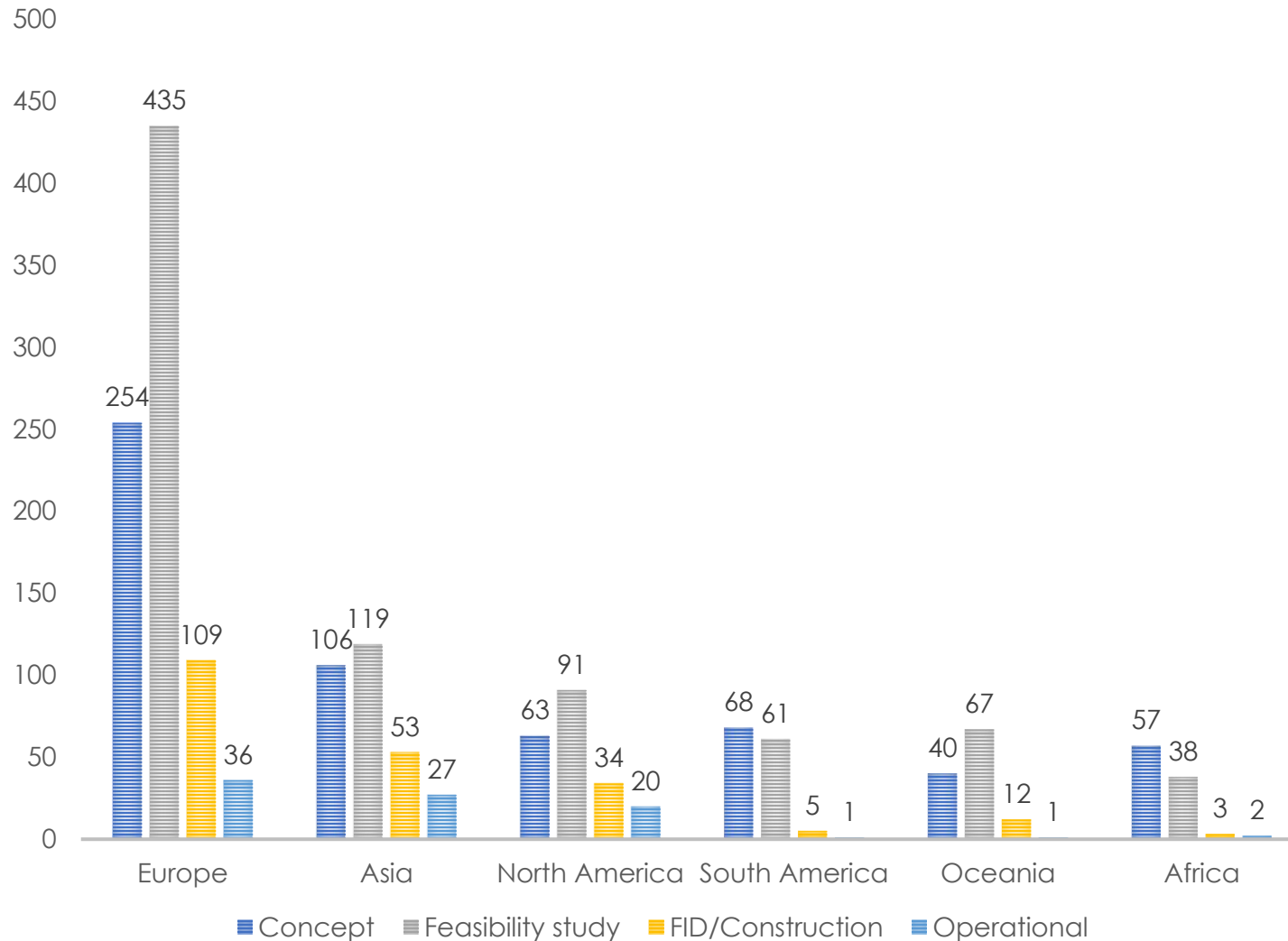


### Challenges and Market Development

- Most projects **are still in early planning**, with many **facing delays or cancellations** due to regulatory, financial, or technical barriers
- Despite growing policy and investment support, **the scale-up needed to meet 2030 targets remains substantial**

# Breakdown of the [Global](#) low-emission\* H2 Projects

## Approximately 1.700 projects ( $\geq 5$ MWe) are announced



### Key Insights

- Globally, **over 80% of the low-emission** hydrogen projects remain in early development (Concept and Feasibility stages), with a clear bottleneck in progressing to construction. This is largely due to challenges in securing funding, subsidies, and permits.
- Operational maturity remains limited, **with only 87 projects currently in operation (~5% of the total pipeline)**.
- **Europe leads across all stages of project development**, followed by Asia, which demonstrates strong early-stage activity. **North America has a well-distributed pipeline**, but lags in conversion to execution. South America and Africa are showing increasing interest, **while Oceania demonstrates a disproportionately high level of activity relative to its size**.
- The **global market remains in a formative phase**, characterized by high project attrition, extended development timelines, and evolving regulatory and offtake frameworks.
- Early movers **advancing to FID and operational stages**, particularly in less saturated regions, are likely to benefit from strategic advantages.

# Key insights into the European Low-Emissions Hydrogen Sector Challenges in Regulation & Funding blocking the EU from meeting its “10+10” Mt RePower EU targets



## Current Demand & Supply Outlook

- Hydrogen demand **reached 7.9 Mt in 2023, down 3% compared to the 8.2 Mt reported for 2022 and close to 15% fall since 2020**
- **Ammonia and methanol** production are the ones affected the most with **36% and 25%** decrease respectively



## Low-Emissions H2 Market Outlook in 2030

- Announced projects could scale low-emissions hydrogen production to **14.4 Mt/year by 2030, yet this figure is overly ambitious given the current trajectory of the market**



## Predominant Sectoral Use

- Demand is **still heavily concentrated in refining and chemical sectors**, mostly met by unabated fossil-based hydrogen



## Challenges and Market Development

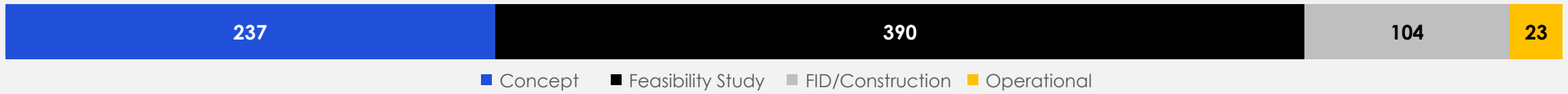
- Most projects **are still in early planning**, with many **facing delays or cancellations** due to regulatory, financial, or infrastructure barriers.
- Despite growing policy and investment support, **the scale-up needed to meet 2030 targets remains substantial**

# Breakdown of the European **Electrolytic H<sub>2</sub> Projects** by maturity level

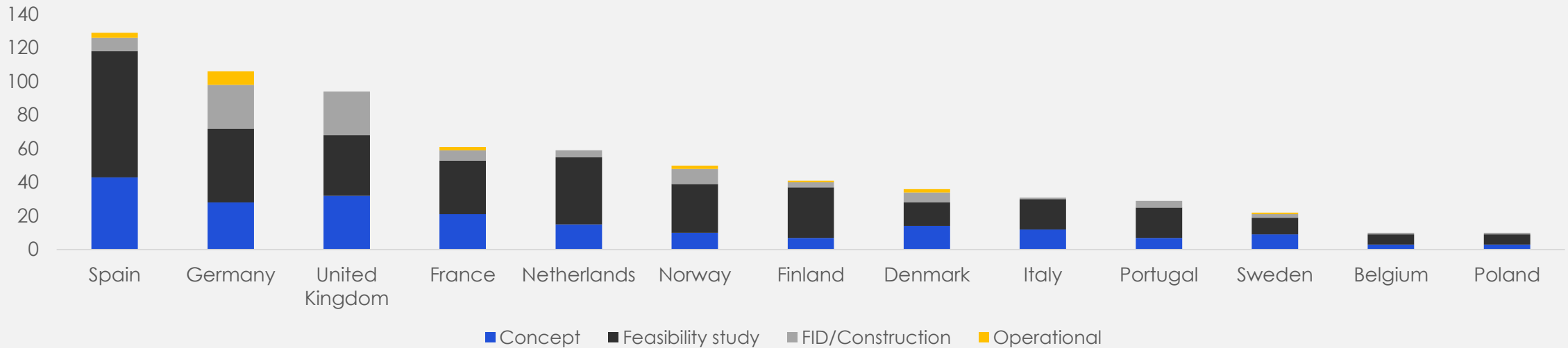
## 753 Projects are announced by EU countries



**European Electrolytic H<sub>2</sub> Projects**  
(Breakdown by maturity level)



**Countries with more than 10 projects announced**  
(Represent 680/753 Projects)

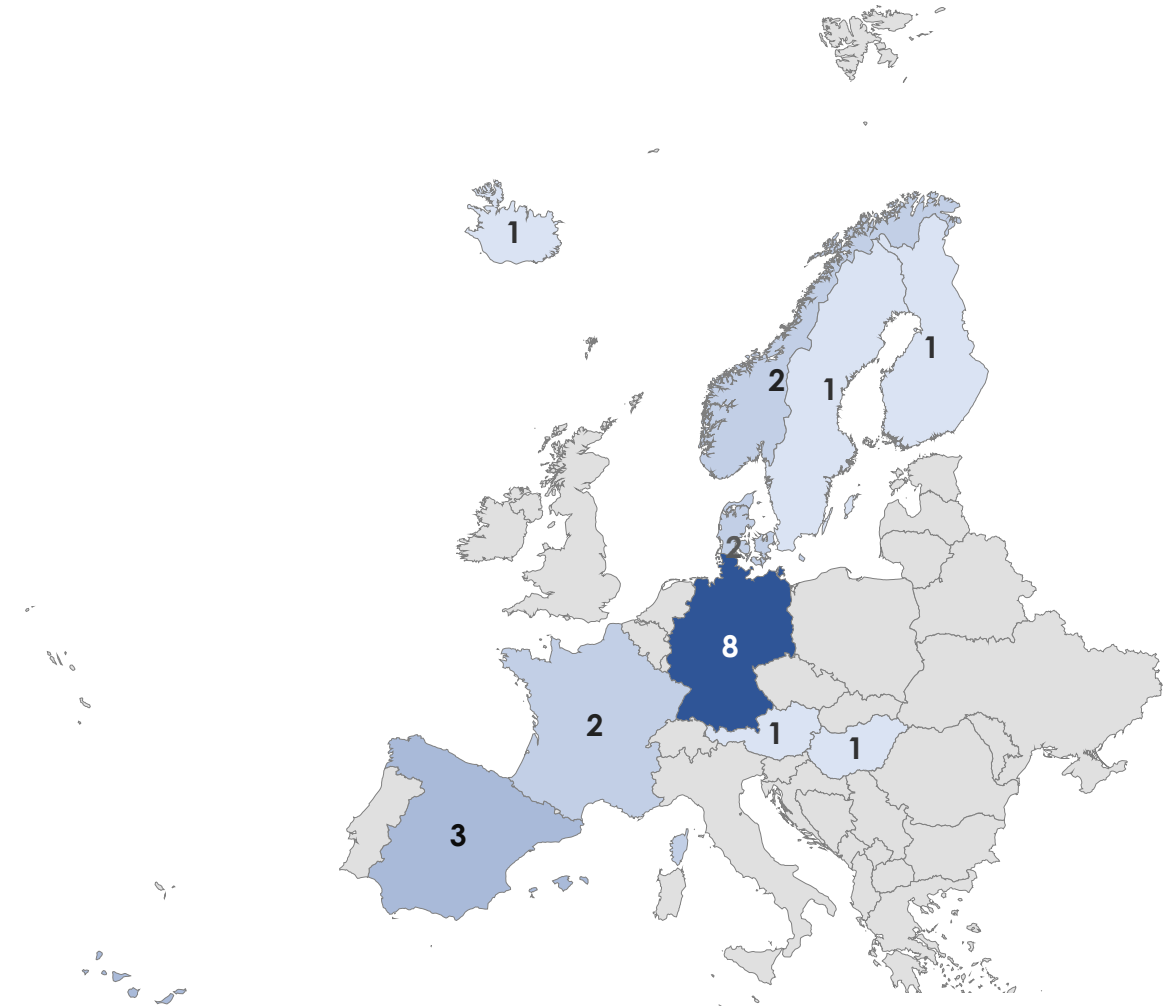


# 23 European Electrolytic Projects are in “Operational Phase” with installed capacity $\geq 5$ MWel each



## Key Insights

- **23 Projects** (~0.4 GWel) are currently in operational phase in Europe representing just 2.8% of the total announced projects
- Approximately **40 Kt H2** per year is produced by those projects
- Installed capacity ranges **from small-scale** plants of **5–10 MW** up to **larger facilities of 20–54 MW** – the largest being the Hy4Chem project in Germany (**54 MWel**)
- Germany hosts the largest number of operational renewable hydrogen projects, while other active deployments are found in Spain, the Nordic countries (Norway, Sweden, Finland, Denmark)
- **Ammonia and refining lead the renewable hydrogen** deployment due to their maturity and stable demand, while mobility, synthetic fuels, and power applications remain in earlier stages with selective projects
- 13 out of 23 projects rely solely on dedicated renewables (direct line), 7 use grid-connected sources (virtual PPAs), and 3 are unknown

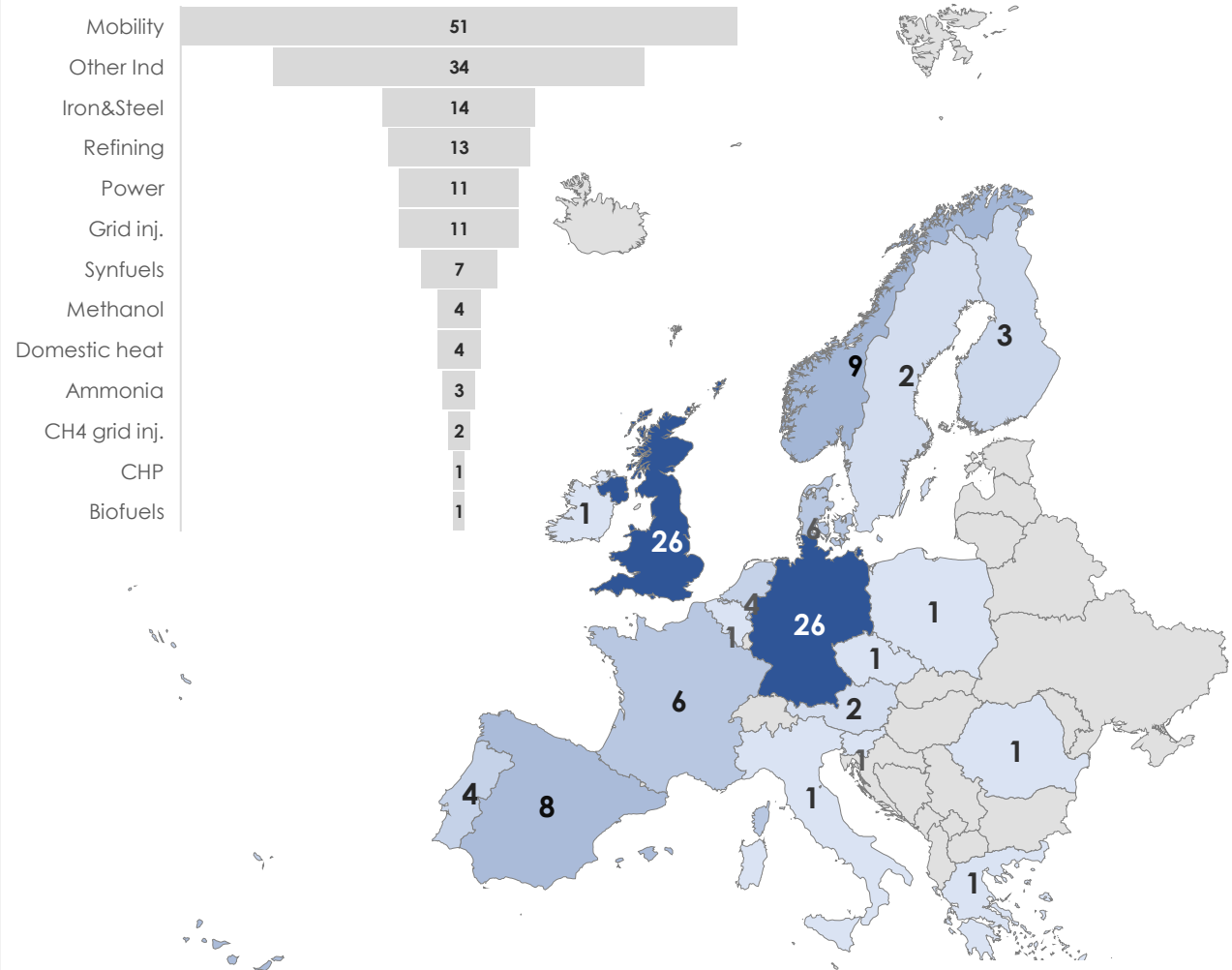




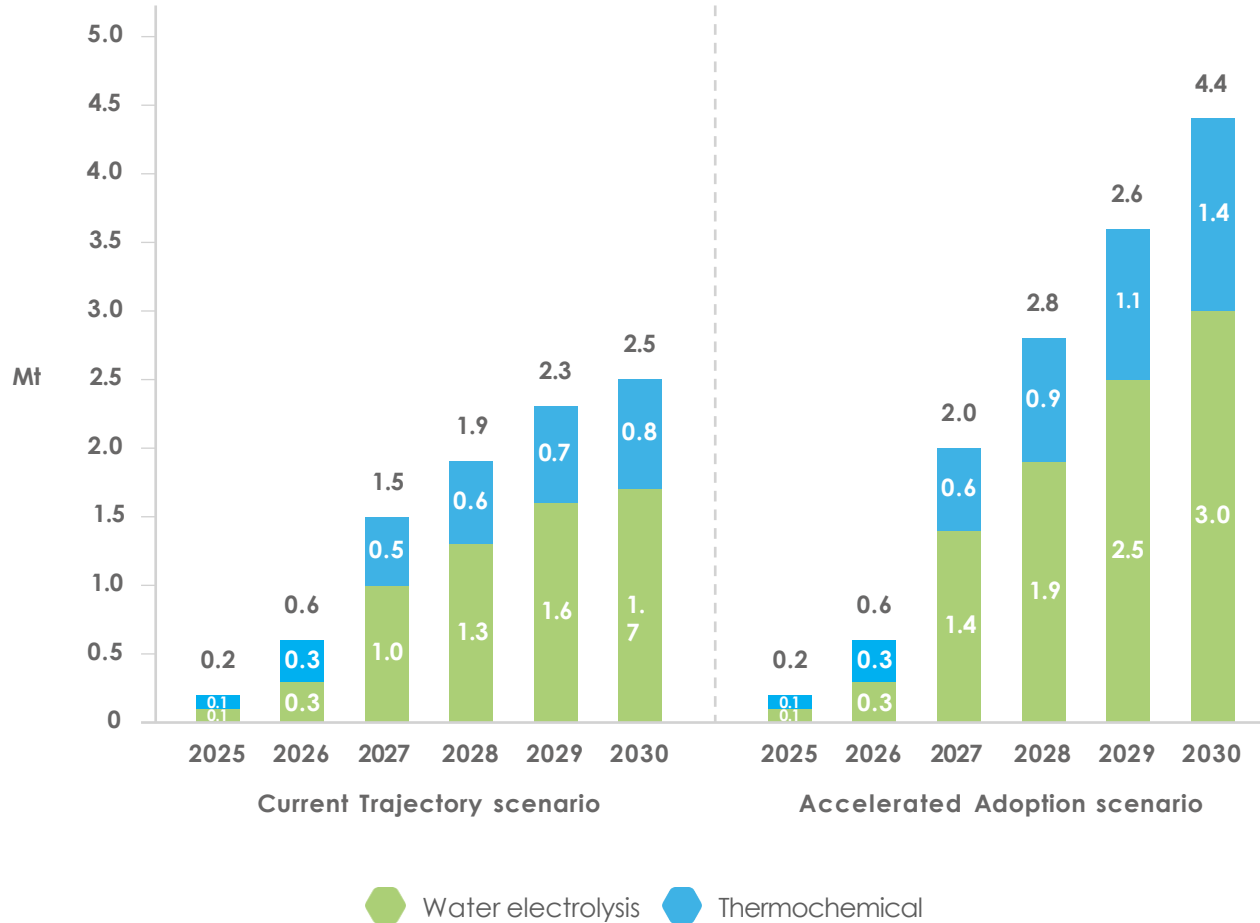
# 104 European Electrolytic Projects are in “FID/Construction phase” with installed capacity $\geq 5$ MWel each

## Key Insights

- **104 electrolytic projects (~5 GWel)** are currently in FID/Construction phase in Europe representing 14% of the total announced projects
- Once those projects become operational, approximately **800 Kt H2** per year will be produced
- The largest plant will be in Boden, Northern Sweden (**740 MWel**). It will target the European steel market, source electricity from a hydropower plant, and is expected to produce 2.4 million tonnes of green steel per year.
- **Germany and the UK host the largest number of projects**, while **Iberia** countries, the **Nordic countries** (Norway, Sweden, Finland, Denmark) and France are demonstrating a strong momentum of the electrolysis projects' development
- **Mobility is the dominant end use for electrolyzer projects currently in the FID or construction phase (51 projects), typically involving smaller-scale plants (5–45 MWel)**. This is followed by industrial applications (34 projects), iron and steel (14), which are associated with the largest-scale plants (mostly above 50 MWel), and refining (13). Additional end uses include power generation, grid injection, synthetic fuels, and emerging sectors such as methanol, ammonia, and domestic heating.
- **Nearly 60% of these projects** will rely on a direct line with RES to source electricity



# According to Hydrogen Europe, Europe can expect a supply of 2.5 to 4.4 Mt of clean hydrogen by 2030






Source: Hydrogen Europe – Clean Hydrogen Monitor 2024

## Key Insights

- The European Hydrogen Strategy **set the goal of 10 Mt of hydrogen production by 2030**.
- However, according to Hydrogen Europe, the Current Trajectory scenario **forecasts 2.5 Mt** (1.7 Mt Electrolytic and 0.8 Mt Thermochemical) by 2030.
- The main hurdles that project developers are confronted with include:
  - Overly stringent rules for electricity sourcing (i.e. Delegated Acts for RFNBO)
  - Complex funding procedures & delays to incentives
  - Lack of supporting infrastructure
  - Regulatory uncertainty
  - Licensing & Permitting challenges
- Under the Accelerated Adoption scenario, improved market conditions could enable European projects to supply **4.4 Mt of hydrogen (3 Mt from electrolysis and 1.4 Mt from thermochemical pathways)**; yet this remains well below the European Hydrogen Strategy's target of up to 10 Mt of renewable hydrogen by 2030.

# Critical next steps for the European Hydrogen Market



Area	Issues	Critical Next Steps	Leading Member States & Examples
 <p><b>Regulatory Framework</b></p>	<ul style="list-style-type: none"><li>• <b>Overly complex</b> or even inexistent regulatory framework at EU level</li><li>• Only <b>a limited number of countries</b> have proceeded with the transposition of <b>RED III (2/27 countries) and the Hydrogen &amp; Gas Markets Package</b></li></ul>	<ul style="list-style-type: none"><li>• The revision of the <b>RFNBO DAs</b> <u>to unblock projects from early-stage development</u></li><li>• The <b>clarification of the penalties</b> for non-compliance with the EU targets <u>to boost the demand</u></li><li>• The establishment of National Regulatory Frameworks <u>to remove uncertainty</u></li></ul>	<ul style="list-style-type: none"><li>• <b>Romania and Czechia</b>, have so far transposed the industrial and transport mandates for RFNBO (although they have not transposed the rest of RED III), while <b>Denmark and Finland</b> have transposed the transport mandates only.</li><li>• Several other countries are in advanced stages (<b>Germany, Netherlands, Portugal</b>)</li></ul>
 <p><b>Funding Mechanisms</b></p>	<ul style="list-style-type: none"><li>• <b>EU-level funding support</b> remains limited and complex, with no geographical differentiation across Europe, though it is moving in the right direction in terms of support mechanisms</li><li>• <b>National level funding support:</b> some member states have not devised any funding support</li></ul>	<ul style="list-style-type: none"><li>• <b>The further strengthening of the EUH2Bank</b> to promptly <u>pull projects towards FID/the Construction phase</u></li><li>• <b>The development of tailor-made mechanisms</b> based on OPEX (or hybrid) schemes by Member States, or their participation in the EU Hydrogen Bank's Auction-as-a-Service, is essential</li></ul>	<ul style="list-style-type: none"><li>• <b>Germany, UK, Netherlands, France, Norway, Spain, Portugal</b> and many other member states have launched auctions</li><li>• <b>Germany, Austria, Lithuania and Spain</b> participated in the Auction-as-a-Service in one of the two already complete auctions with more than 1 billion euros collectively contributed</li></ul>
 <p><b>Infrastructure Development</b></p>	<ul style="list-style-type: none"><li>• Slow progress in terms of <b>developing hydrogen transport, storage and import facilities</b></li><li>• The supply corridors proposed by the European Hydrogen Backbone <b>are still in early development stages, hindering the linkage between demand &amp; supply</b></li></ul>	<ul style="list-style-type: none"><li>• The <b>acceleration of the Hydrogen &amp; Gas Markets Package transposition</b> by the member states</li><li>• The appointment of <b>Hydrogen Network Operators</b> which <u>will unlock the development of the critical infrastructure</u></li></ul>	<ul style="list-style-type: none"><li>• <b>Several initiatives regarding the development of hydrogen corridors</b> are announced across Europe, such as SEEHyc, SouthH2 Corridor etc.</li><li>• <b>Germany</b>, amongst others, has proceeded with the design of a national H2 network (~10.000 km), involving also the repurposing of existing pipelines</li></ul>

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We invite you to visit our website

[www.hellenic-hydrogen.gr](http://www.hellenic-hydrogen.gr)

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